User Manual

16

TK-78K0R/KE3L+USB

16-bit Microcontroller Starterkit

µPD78F1026

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R20UT0010ED0100, Rev. 1.00
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General Precautions in the Handling of MPU/MCU Products

The following usage notes are applicable to all MPU/MCU products from Renesas. For detailed usage notes on the products covered by this manual, refer to the relevant sections of the manual. If the descriptions under General Precautions in the Handling of MPU/MCU Products and in the body of the manual differ from each other, the description in the body of the manual takes precedence.

1. Handling of Unused Pins
   Handle unused pins in accord with the directions given under Handling of Unused Pins in the manual.

   The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible. Unused pins should be handled as described under Handling of Unused Pins in the manual.

2. Processing at Power-on
   The state of the product is undefined at the moment when power is supplied.

   The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the moment when power is supplied.
   In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the moment when power is supplied until the reset process is completed.
   In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the moment when power is supplied until the power reaches the level at which resetting has been specified.

3. Prohibition of Access to Reserved Addresses
   Access to reserved addresses is prohibited.

   The reserved addresses are provided for the possible future expansion of functions. Do not access these addresses; the correct operation of LSI is not guaranteed if they are accessed.

4. Clock Signals
   After applying a reset, only release the reset line after the operating clock signal has become stable. When switching the clock signal during program execution, wait until the target clock signal has stabilized.

   When the clock signal is generated with an external resonator (or from an external oscillator) during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Moreover, when switching to a clock signal produced with an external resonator (or by an external oscillator) while program execution is in progress, wait until the target clock signal is stable.

5. Differences between Products
   Before changing from one product to another, i.e. to one with a different part number, confirm that the change will not lead to problems.

   The characteristics of MPU/MCU in the same group but having different part numbers may differ because of the differences in internal memory capacity and layout pattern. When changing to products of different part numbers, implement a system-evaluation test for each of the products.

How to Use This Manual

(1) Purpose and Target Readers

This manual is designed to provide the user with an understanding of the hardware functions and electrical characteristics of the MCU. It is intended for users designing application systems incorporating the MCU. A basic knowledge of electric circuits, logical circuits, and MCUs is necessary in order to use this manual. The manual comprises an overview of the product; descriptions of the CPU, system control functions, peripheral functions, and electrical characteristics; and usage notes.

Particular attention should be paid to the precautionary notes when using the manual. These notes occur within the body of the text, at the end of each section, and in the Usage Notes section.

The revision history summarizes the locations of revisions and additions. It does not list all revisions. Refer to the text of the manual for details.

The following documents apply to the xxx/xx Group. Make sure to refer to the latest versions of these documents. The newest versions of the documents listed may be obtained from the Renesas Electronics Web site.

Document Type	Description	Document Title	Document No.
Data Sheet	Hardware overview and electrical characteristics	xxx/xx Group Datasheet	R01DSxxxxEJxxxx
User's manual for Hardware	Hardware specifications (pin assignments, memory maps, peripheral function specifications, electrical characteristics, timing charts) and operation description. Note: Refer to the application notes for details on using peripheral functions.	xxx/xx User's manual for Hardware	This User's manual
User's manual for Software	Description of CPU instruction set	xxx/xx Series User's manual for Software	R01USxxxxEJxxxx
Application Note	Information on using peripheral functions and application examples. Sample programs. Information on writing programs in assembly language and C.	Available from Renesas Electronics Web site.	
Renesas Technical Update	Product specifications, updates on documents, etc.		

(2) Notation of Numbers and Symbols

Conventions	
Data significance:	Higher digits on the left and lower digits on the right
Active low representations:	××× (overscore over pin and signal name)
Note:	Footnote for item marked with Note in the text
Caution:	Information requiring particular attention
Remark:	Supplementary information

Numerical representations:	
Binary	...×××× or ××××B
Decimal	...××××
Hexadecimal	...××××H

(3) List of Abbreviations and Acronyms

Abbreviation	Full Form
CS78K	C-Spy for 78K
EW78K	Embedded Workbench for 78K
I/O	Input/Output
LSB	Least Significant Bit
MSB	Most Significant Bit
SFR	Special Function Register
USB	Universal Serial Bus

Acronyms	Full Form

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(4) Related Documents

The related documents indicated in this publication may include preliminary versions. However, preliminary versions are not marked as such.

Doc. Number	Document Title
R01AN0009ED0100	78K0R/KE3-L(USB) USB HID (Human Interface Device) Class Driver
R01AN0008ED0100	78K0R/KE3-L(USB) USB CDC (Communication Device Class) Driver
U20024EJ2V0UD00	User's Manual 78K0R/Kx3-L 16-bit Single-Chip Microcontrollers

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Chapter 1 Introduction

TK-78K0R/KE3L+USB is the evaluation kit for development with sound systems using "78K0R/KE3-L", Renesas Electronics 16bit all flash microcontroller.

The user only needs to install the development tools and USB driver, and connect the host machine with the target board to start the code development, build, monitoring the output, and debugging code.

(This demonstration kit uses the on-chip debug feature from the microcontroller itself, without emulator connection)

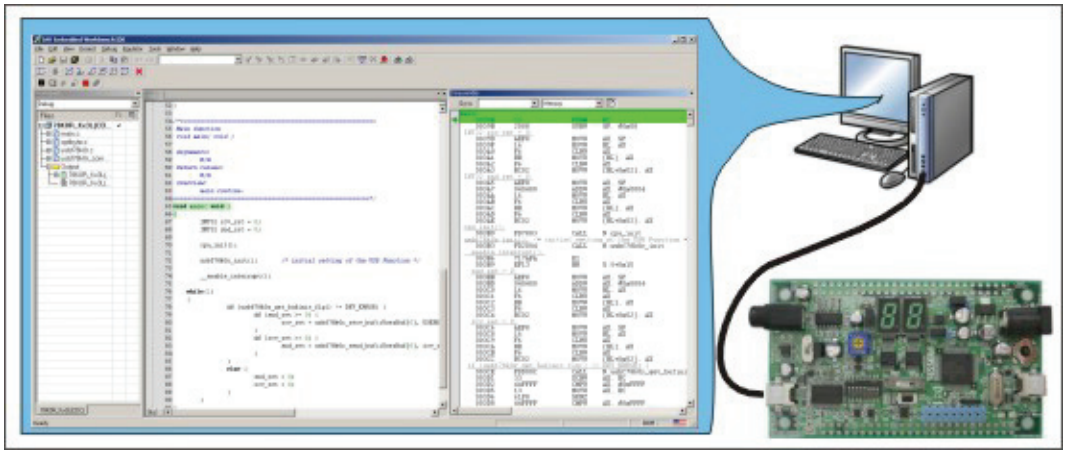


Figure 1 Debug Configuration

Overview

This manual consists of the following contents.Read chapter 2 and 3 first for installing the development tools and using the sample programs. Read chapter 4-6 for customizing the sample programs and the hardware.

Chapter 2: Preparations

Install the development tools

Chapter 3: Experiences

Experience the basic operations of integrated development environment (Embedded Workbench) and integrated debugger (C-Spy) with using sample programs.

Chapter 4: Hardware Specifications

Explain the hardware of TK-78K0R/KE3L+USB

Chapter 5: Troubleshooting

Describe how to solve troubles you may face, such as errors when starting the integrated debugger (C-Spy)

Chapter 6: Other Information

Introduce other information, such as how to create a new workspace (project) on integrated development environment (Embedded Workbench, how to register additional source file, and some useful tips of the integrated debugger. The circuit diagrams of demonstration kit are included in this chapter.

Reader

This manual is intended for development engineers who wish to become familiar with the development tools for the 78K0R. It is assumed that the readers have been familiar with basics of microcontrollers, C and Assembler languages, and the Windows™ operating system.

Purpose

This manual is intended to give users an understanding of the features, hardware configurations, development tools for the 78K0R.

Chapter 2 Preparation

This chapter describes following topics:

- Overview and installation of development tools
- Installation of development tools
- Overview and preparation of sample programs

Users can experience the development flow such as coding, build, debugging, and test, by using the development tools bundled with TK-78K0R/KE3L+USB.

2.1 Development Tools / Software

- Integrated Development Environment (IDE) Embedded Workbench for 78K V4.70

  The IDE works on Windows operation system. Users can develop a system efficiently by using the editor, compiler, and debugger.

- C Compiler ICC78K0R V4.70.1 (code size limited version)

  C compiler for the 78K0R microcontrollers. The object code size is limited to 4 KB. This compiles C code for 78K0R and ANSI-C code program into object code.

- Assembler RA78K0R V4.70.1

  Assembler for the 78K0R microcontrollers. This convert the assembler code for 78K0R into object code.

- Integrated Debugger CS78K V4.70

  This is the tool for debugging the object program generated by C compiler and assembler. The debugger enables to do C source level debugging. With the debugger, you can debug the code easily and efficiently by referring and changing variables, using step-in debugging function, and so on.

- Starter Kit USB Driver

  This is a software driver for PC to access to the USB interface of the kit.

- HID Class Sample Program / USB Human Interface Device Class Sample Driver

  The 78K0R/KE3-L is detected as the HID device.This sample program behaves as a keyboard. And it is used in [chapter 2].Please refer to the "USB HID (Human Interface Device) Class Driver application note" for further details.

- CDC Class Sample Program / USB Communication Device Class Sample Driver

  The 78K0R/KE3-L is detected as the CDC device.This sample program behaves as a COM port. Please refer to the "USB CDC (Communication Device Class) Driver application note" for further details.

2.2 Installation of Development Tools

2.2.1 Installation Package

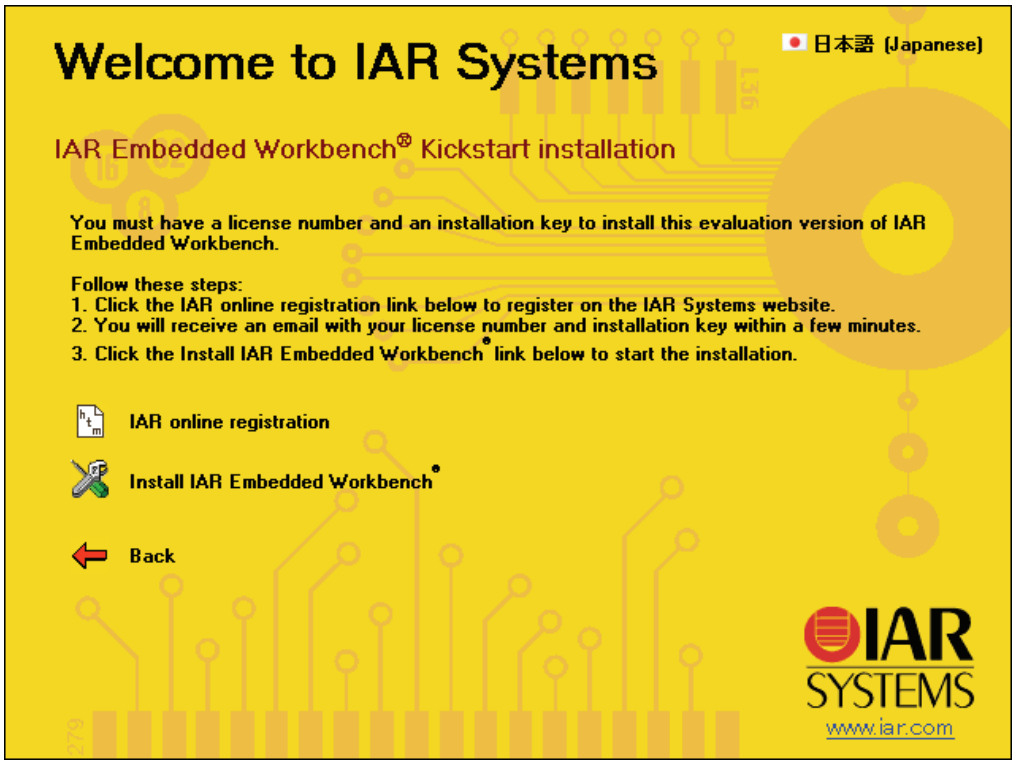
The attached CD-ROM includes the development tools and documentations. Users can use the installer to install those development tools and documentations

2.2.2 Installation of Development Tools

1) Please insert the CD-ROM in the drive. The installer will show up automatically. If it does not start automatically, please initiate it by double clicking ‘Aurorun.EXE’.

2) Click ‘Install IAR Embedded Workbench for 78K’

3) Click Install IAR Embedded Workbench for 78K'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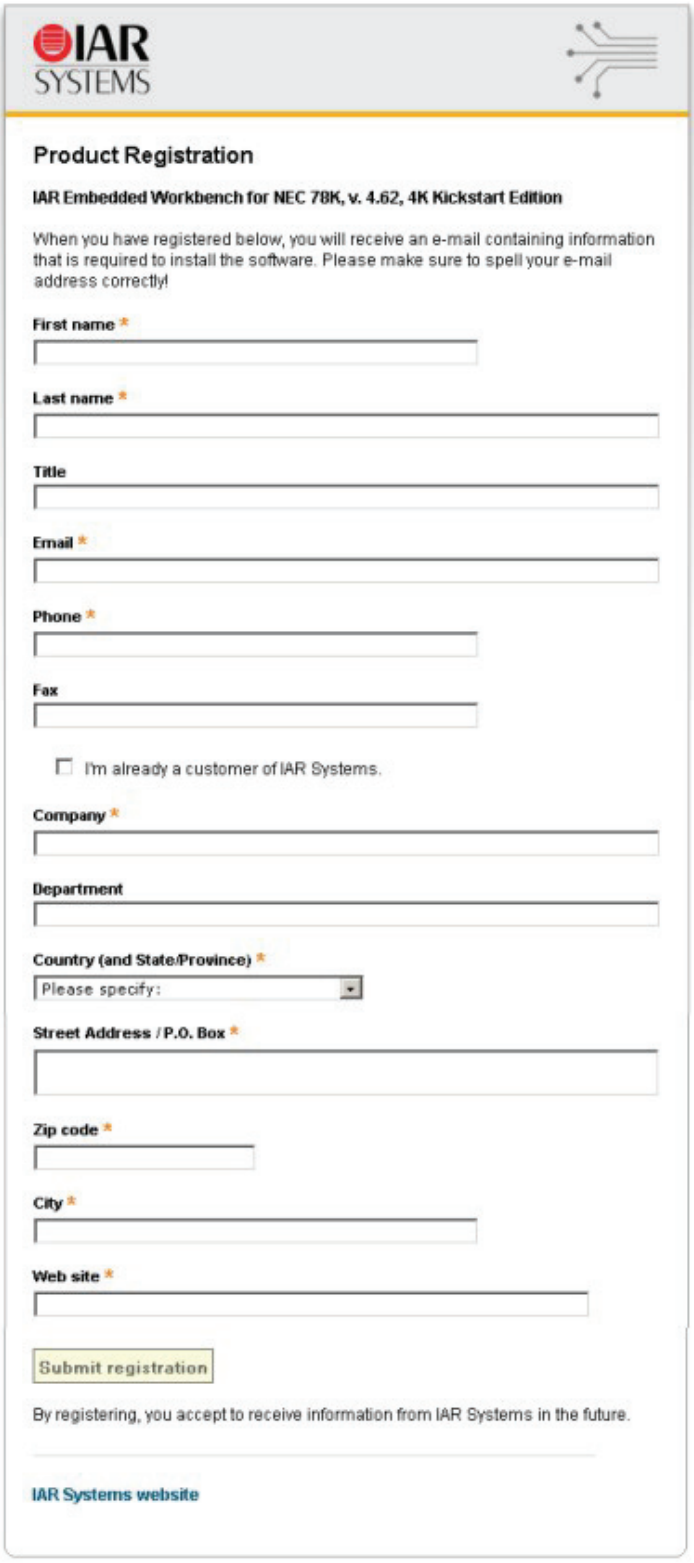

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When you have registered below, you will receive an e-mail containing information that is required to install the software. Please make sure to spell your e-mail address correctly!

First name *

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Title

Email *

Phone *

Fax

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Company *

Department

Country (and State/Province) *

Please specify:

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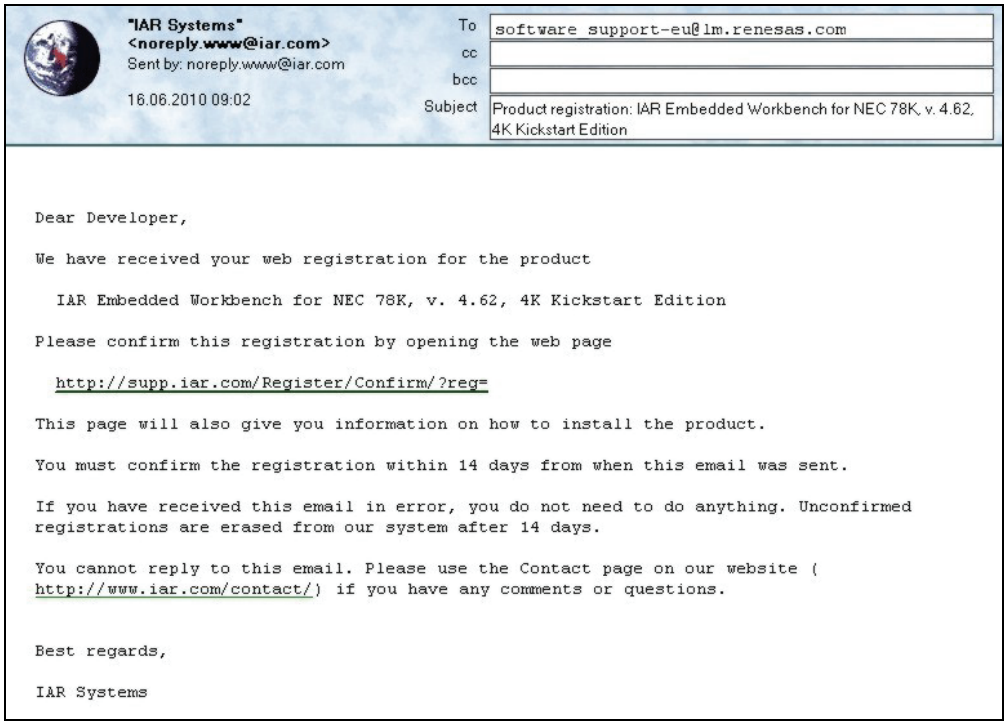

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Sent by: noreply.www@iar.com
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To: software_support-eu@lm.renesas.com
cc:
bcc:
Subject: Product registration: IAR Embedded Workbench for NEC 78K, v. 4.62, 4K Kickstart Edition

Dear Developer,

We have received your web registration for the product

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Please confirm this registration by opening the web page

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This page will also give you information on how to install the product.

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Best regards,

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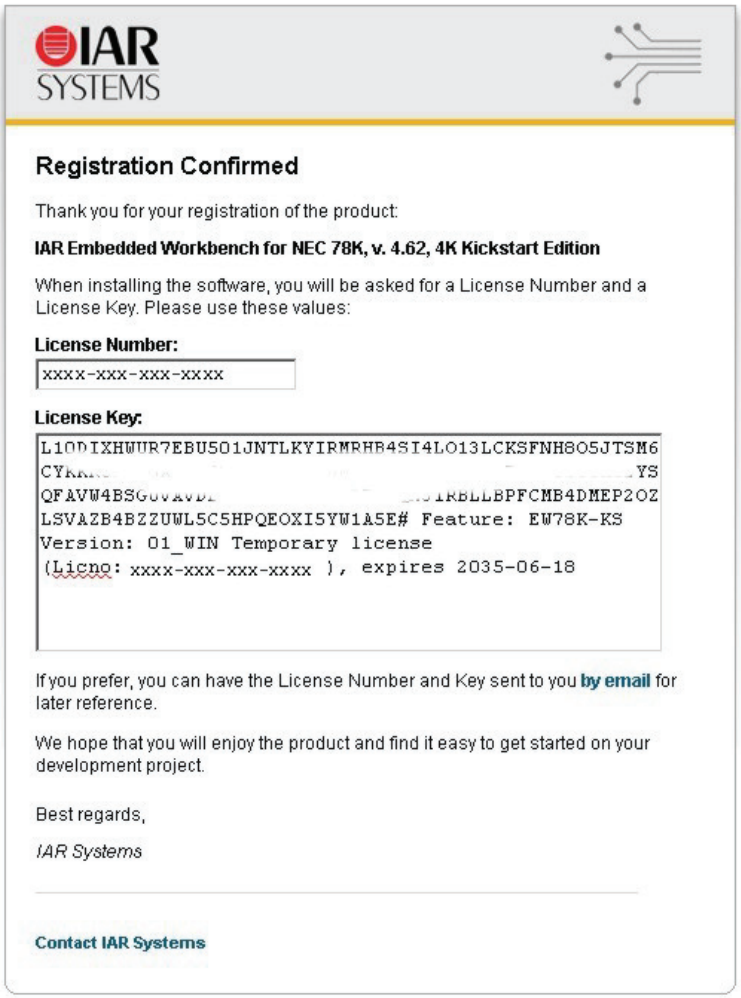
6) Click the Hyperlink to get your requested license key to continue the installation.



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Registration Confirmed

Thank you for your registration of the product:

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When installing the software, you will be asked for a License Number and a License Key. Please use these values:

License Number:

xxxx-xxx-xxx-xxxx

License Key:

```
L1ODIXHWUR7EBU5O1JNTLKYIRMRHB4SI4LO13LCKSFNH8O5JTSM6
CYk...                                                YS
QFAVW4BSG...                                          ...
LSVAZB4BZZUWL5C5HPQEOXI5YW1A5E# Feature: EW78K-KS
Version: 01_WIN Temporary license
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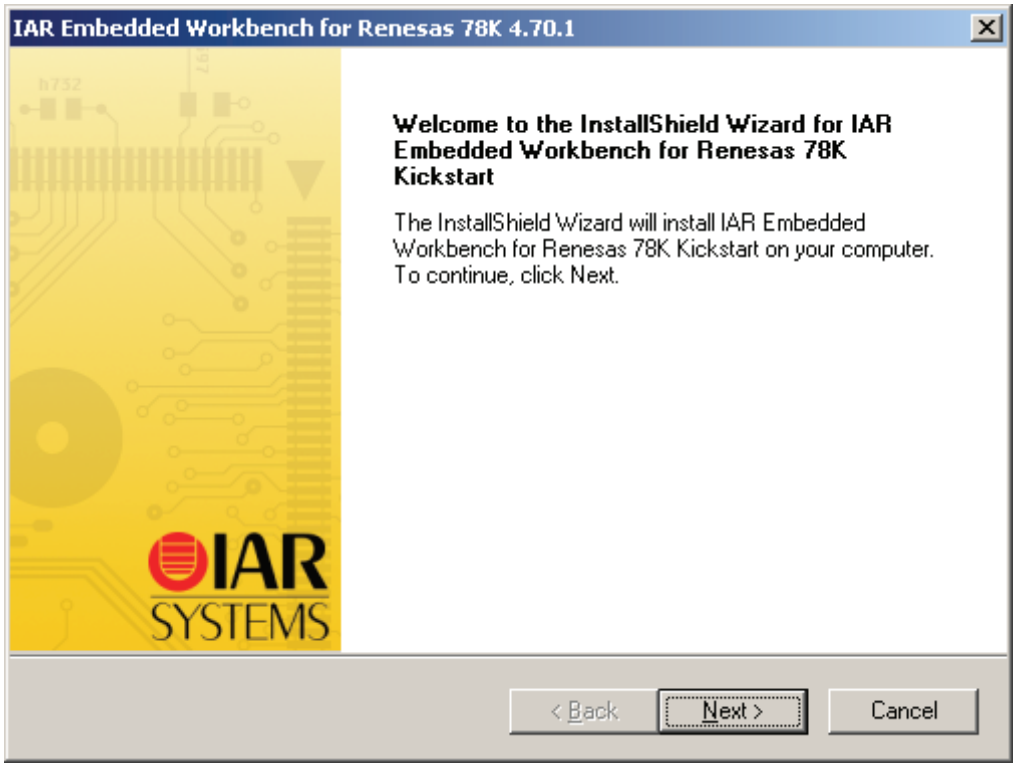
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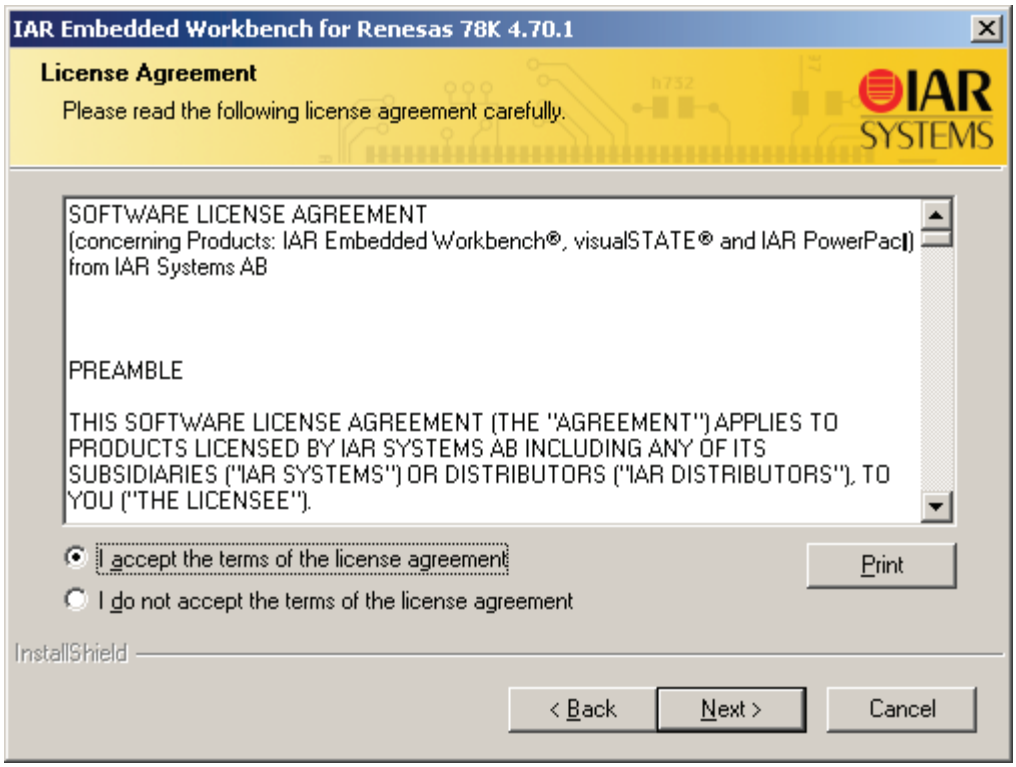
Next >
Cancel

8) Click ‘Next’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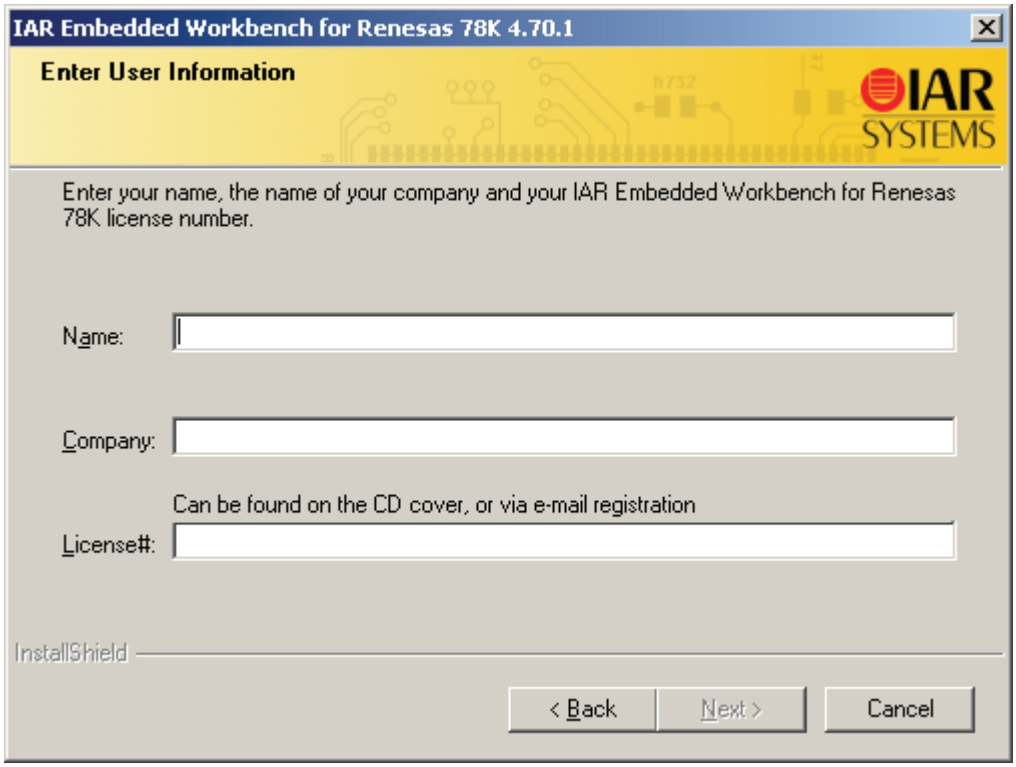
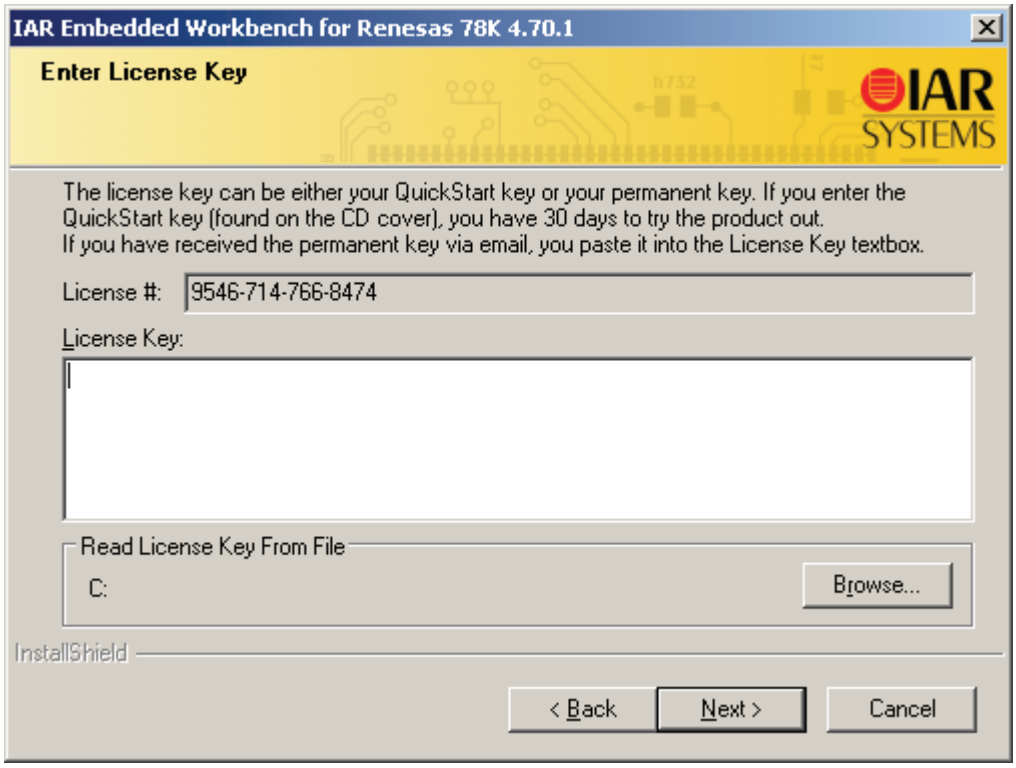
Cancel

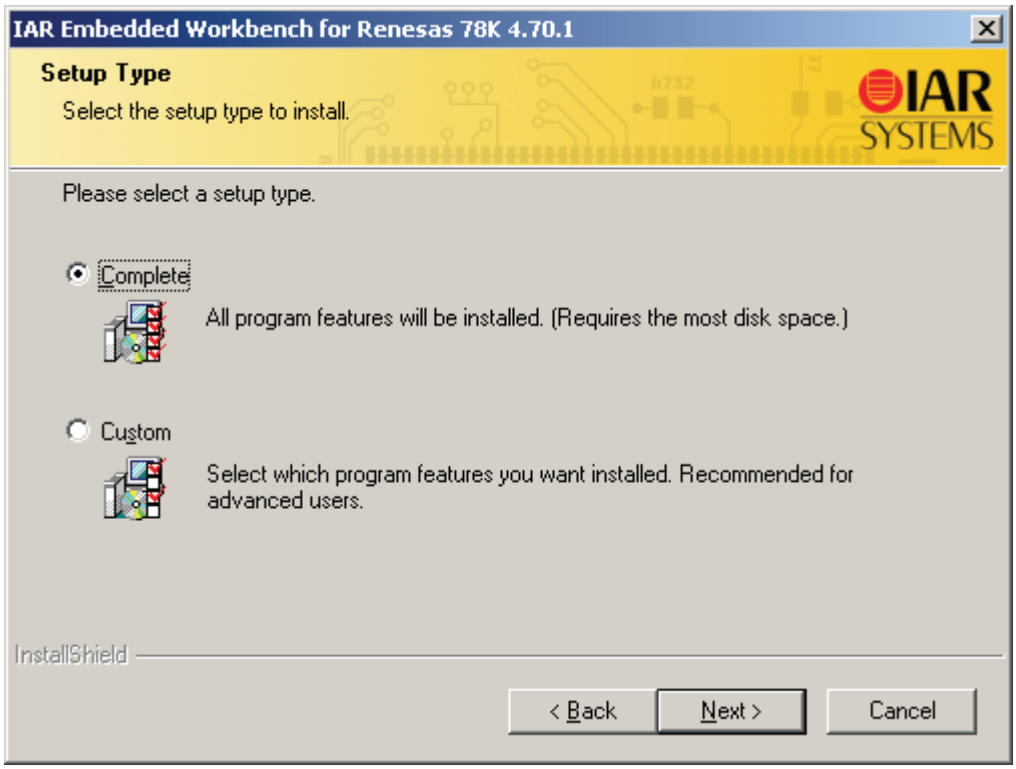
9) Read the license agreement, accept the terms and click ‘Next’


IAR Embedded Workbench for Renesas 78K 4.70.1
Enter User Information
IAR SYSTEMS
Enter your name, the name of your company and your IAR Embedded Workbench for Renesas 78K license number.
Name:
Company:
Can be found on the CD cover, or via e-mail registration
License#:
InstallShield
< Back
Next >
Cancel

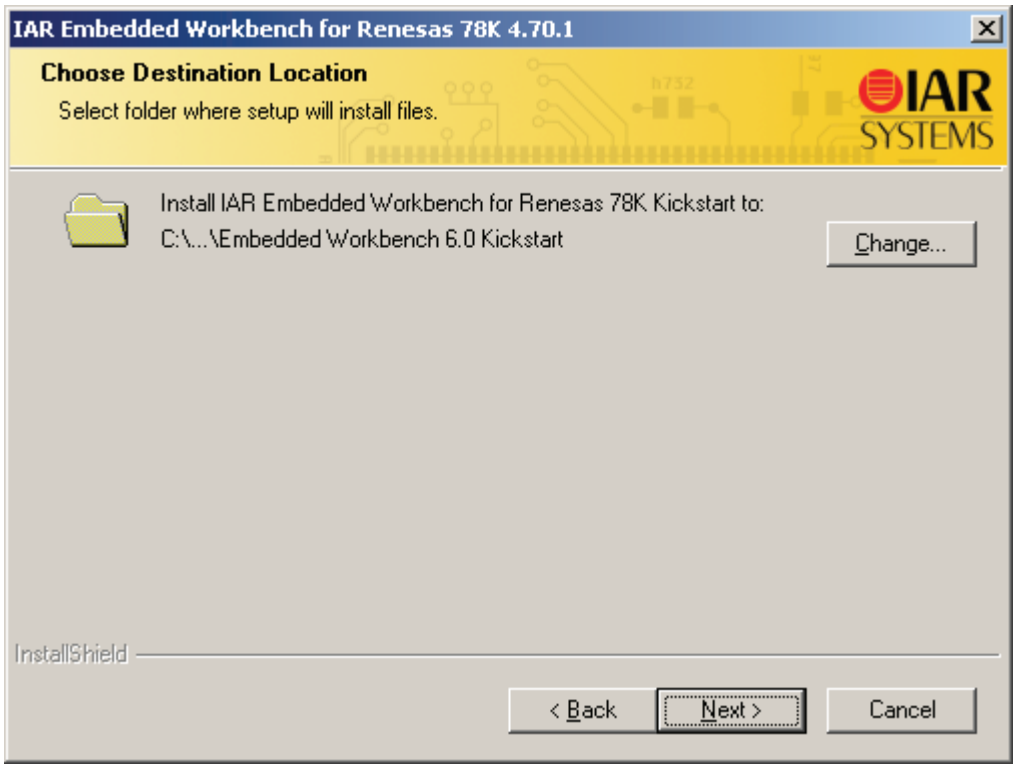
10) Complete the form and click ‘Next’


IAR Embedded Workbench for Renesas 78K 4.70.1
Enter License Key
IAR SYSTEMS
The license key can be either your QuickStart key or your permanent key. If you enter the QuickStart key (found on the CD cover), you have 30 days to try the product out.
If you have received the permanent key via email, you paste it into the License Key textbox.
License #:
9546-714-766-8474
License Key:
Read License Key From File
C:
Browse...
InstallShield
< Back
Next >
Cancel

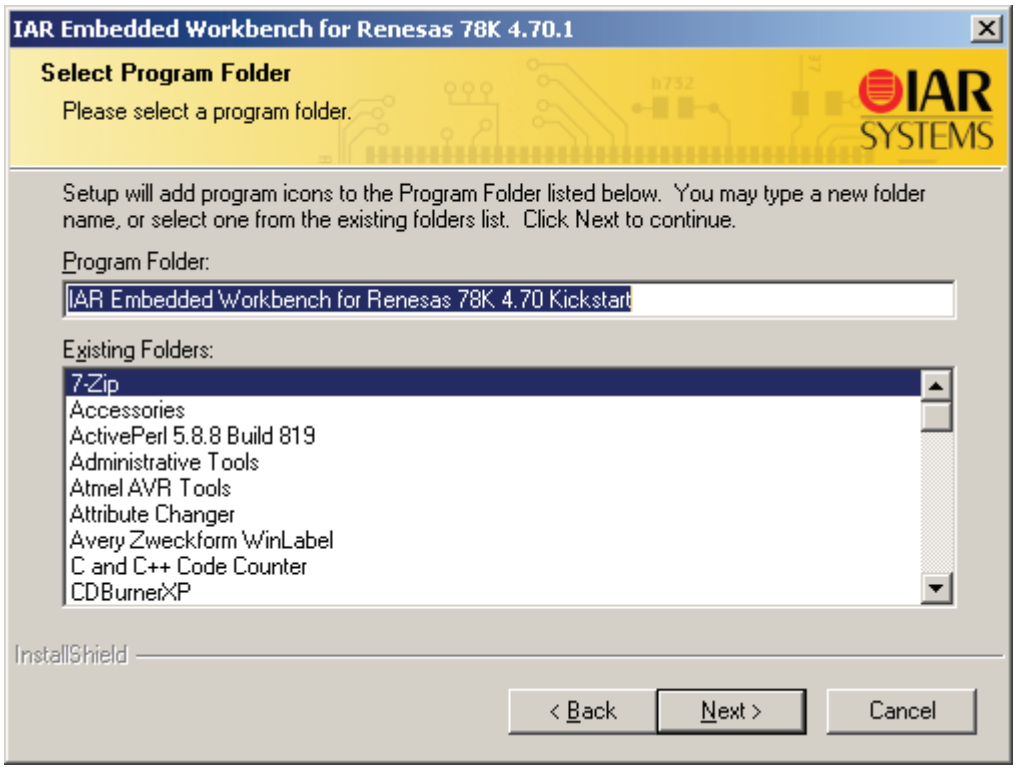
11) Enter the license key by copy and paste, please take care that no linefeed character is included in the license key. Click ‘Next’


IAR Embedded Workbench for Renesas 78K 4.70.1
Setup Type
Select the setup type to install.
IAR SYSTEMS
Please select a setup type.
Complete
All program features will be installed. (Requires the most disk space.)
Custom
Select which program features you want installed. Recommended for advanced users.
InstallShield
< Back
Next >
Cancel

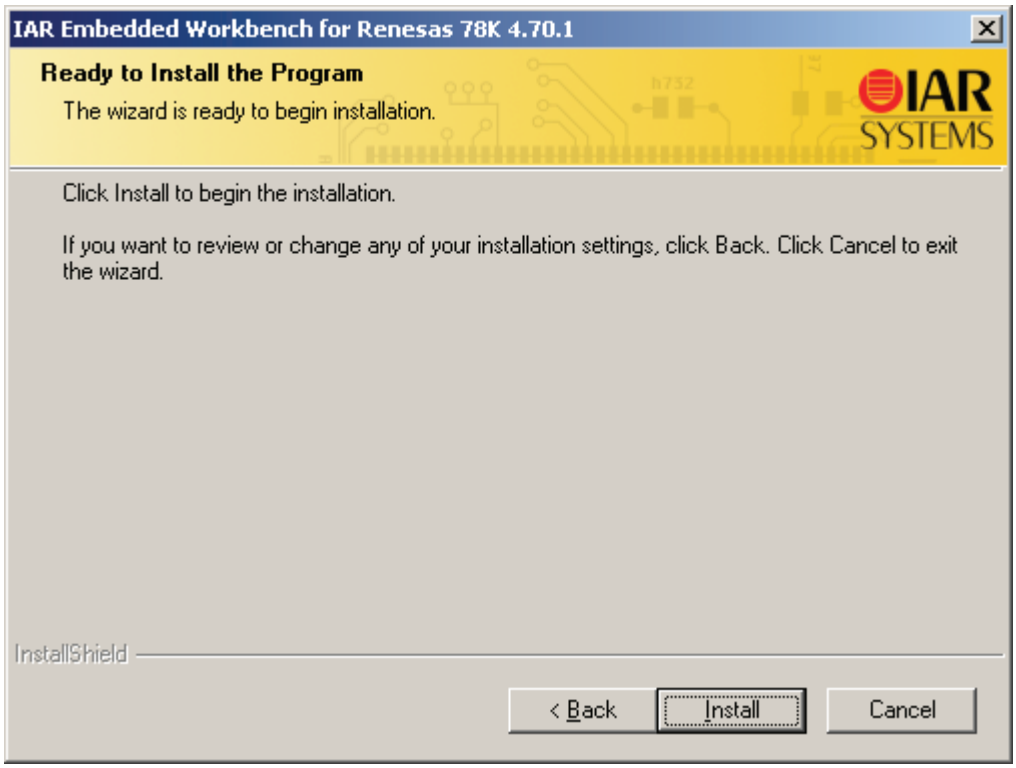
12) Select ‘Complete’ and click ‘Next’



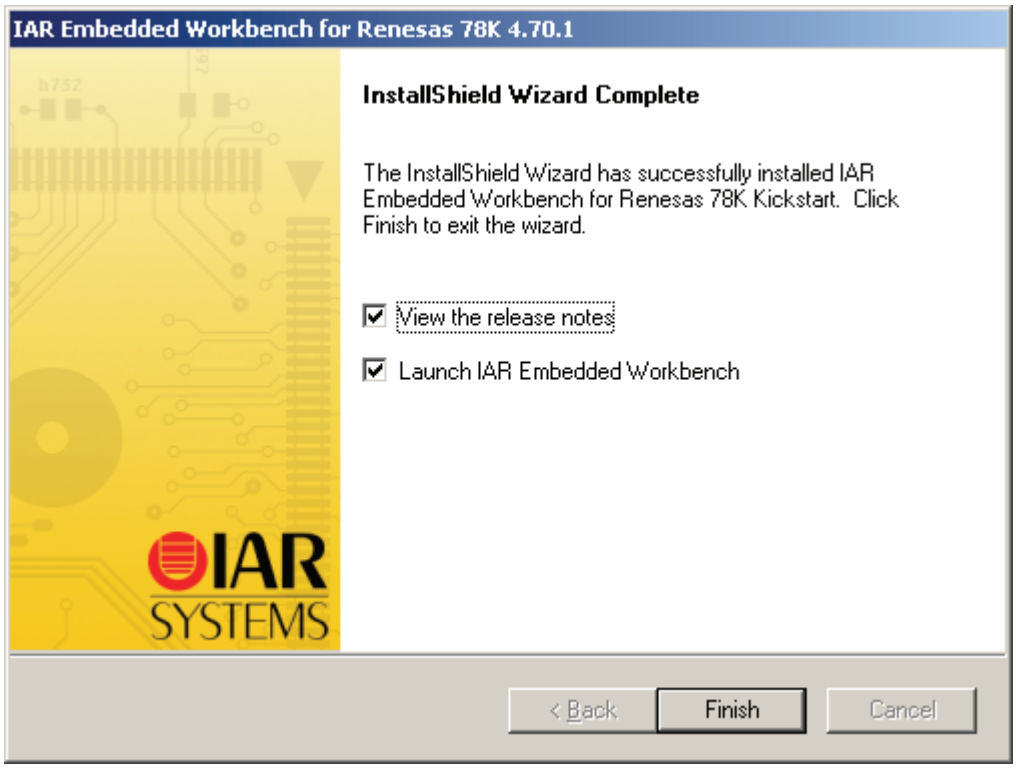
13) Use the default installation folder or choose any other folder and click ‘Next’


IAR Embedded Workbench for Renesas 78K 4.70.1
Select Program Folder
Please select a program folder.
IAR SYSTEMS
Setup will add program icons to the Program Folder listed below. You may type a new folder name, or select one from the existing folders list. Click Next to continue.
Program Folder:
IAR Embedded Workbench for Renesas 78K 4.70 Kickstart
Existing Folders:
7-Zip
Accessories
ActivePerl 5.8.8 Build 819
Administrative Tools
Atmel AVR Tools
Attribute Changer
Avery Zweckform WinLabel
C and C++ Code Counter
CDBurnerXP
InstallShield
< Back
Next >
Cancel

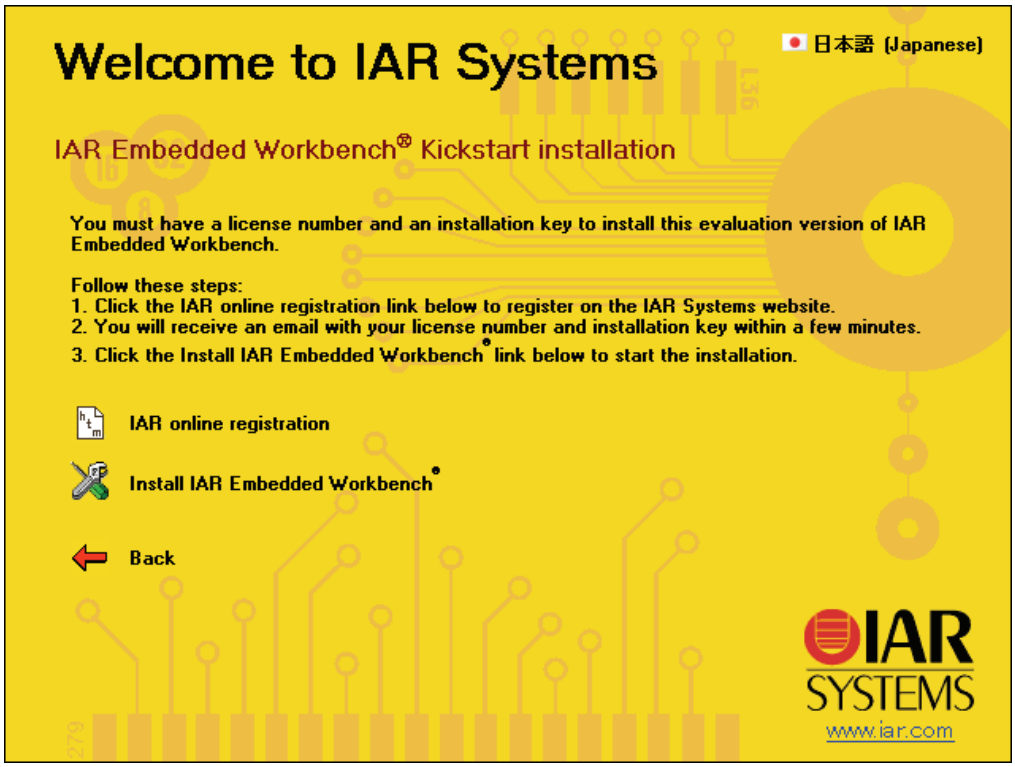
14) Click ‘Next’


IAR Embedded Workbench for Renesas 78K 4.70.1
Ready to Install the Program
The wizard is ready to begin installation.
IAR SYSTEMS
Click Install to begin the installation.
If you want to review or change any of your installation settings, click Back. Click Cancel to exit the wizard.
InstallShield
< Back
Install
Cancel

15) This is the last possibility to modify the installation options. Click ‘Install’ to start the installation.


IAR Embedded Workbench for Renesas 78K 4.70.1
InstallShield Wizard Complete
The InstallShield Wizard has successfully installed IAR Embedded Workbench for Renesas 78K Kickstart. Click Finish to exit the wizard.
View the release notes
Launch IAR Embedded Workbench
IAR SYSTEMS
< Back
Finish
Cancel

16) At the end of a successful installation please select whether you would like to read the release notes and/or to start the IAR Embedded Workbench. Click ‘Finish’ to close the installation tool.

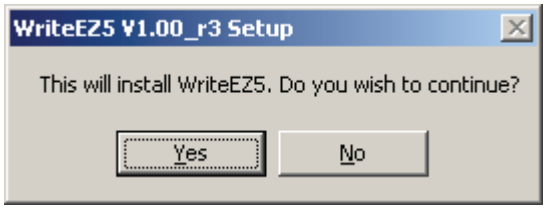

Welcome to IAR Systems
日本語 (Japanese)
IAR Embedded Workbench® Kickstart installation
You must have a license number and an installation key to install this evaluation version of IAR Embedded Workbench.
Follow these steps:
1. Click the IAR online registration link below to register on the IAR Systems website.
2. You will receive an email with your license number and installation key within a few minutes.
3. Click the Install IAR Embedded Workbench® link below to start the installation.
IAR online registration
Install IAR Embedded Workbench®
Back
IAR SYSTEMS
www.iar.com

17) Click ‘Back’ to go to the IAR Installation Overview Window. Please feel free to test also the IAR Systems Visual State Design tool.

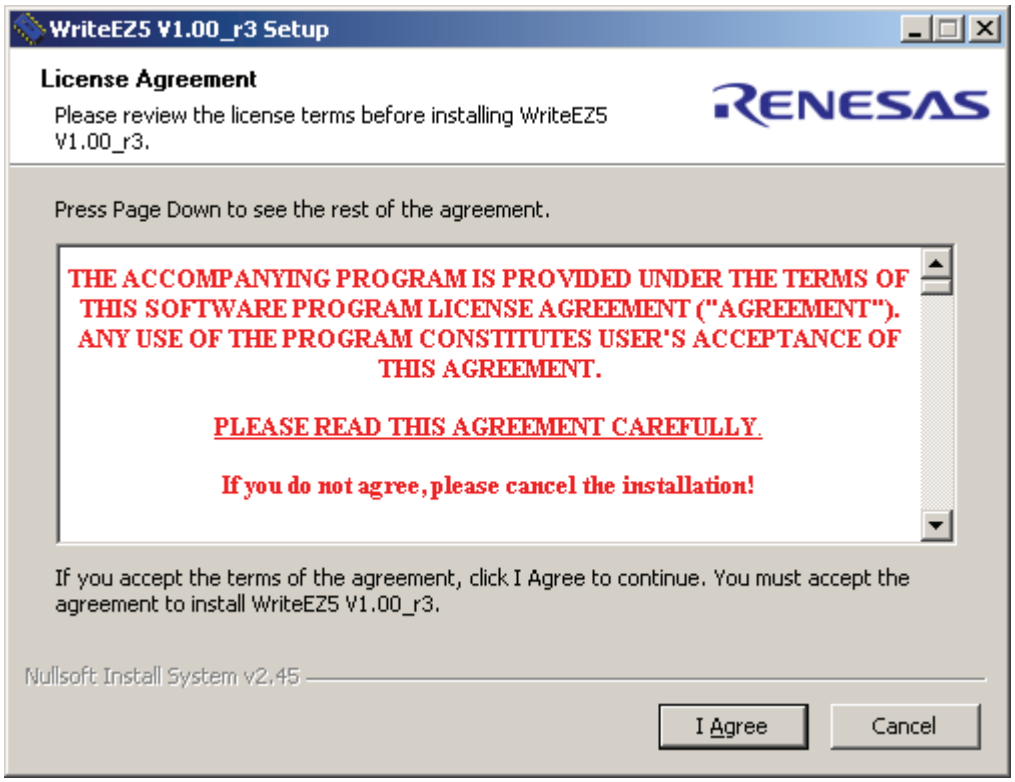
18) Click ‘Exit’ to close the IAR Installation tool.

2.2.3 Installation of WriteEZ5 Flash Programmer

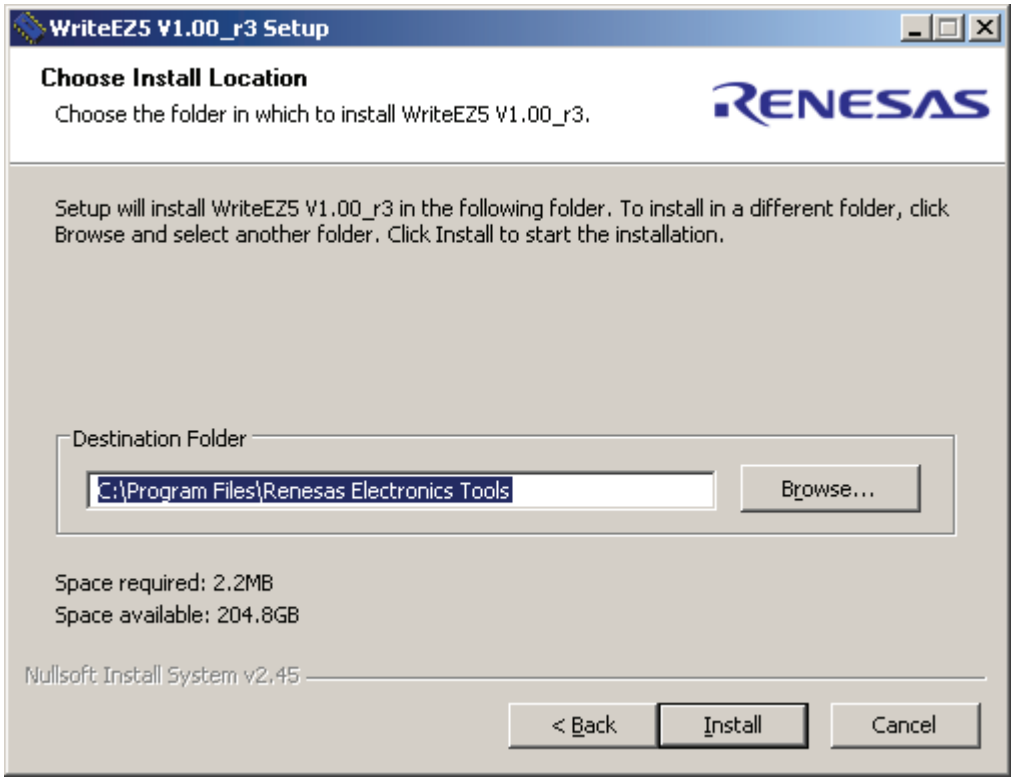
1) Click ‘Install WriteEZ5 Programmer’.



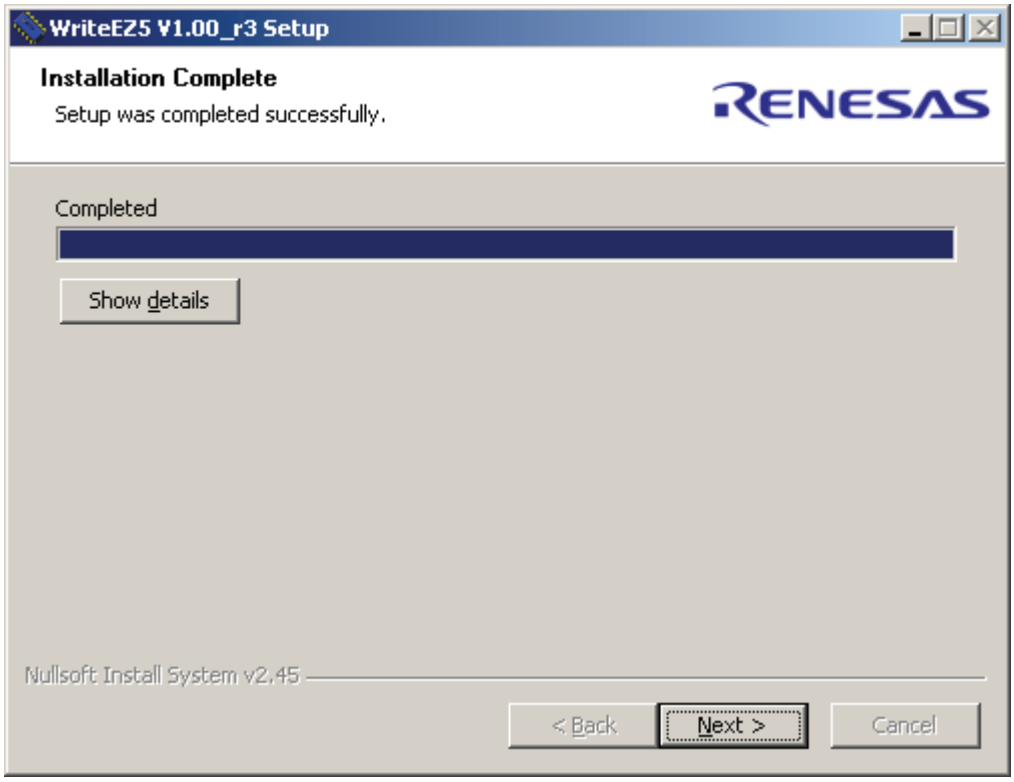
2) Click ‘Yes’ to continue the installation


WriteEZ5 V1.00_r3 Setup
License Agreement
Please review the license terms before installing WriteEZ5 V1.00_r3.
RENESAS
Press Page Down to see the rest of the agreement.
THE ACCOMPANYING PROGRAM IS PROVIDED UNDER THE TERMS OF THIS SOFTWARE PROGRAM LICENSE AGREEMENT ("AGREEMENT"). ANY USE OF THE PROGRAM CONSTITUTES USER'S ACCEPTANCE OF THIS AGREEMENT.
PLEASE READ THIS AGREEMENT CAREFULLY.
If you do not agree, please cancel the installation!
If you accept the terms of the agreement, click I Agree to continue. You must accept the agreement to install WriteEZ5 V1.00_r3.
Nullsoft Install System v2.45
I Agree
Cancel

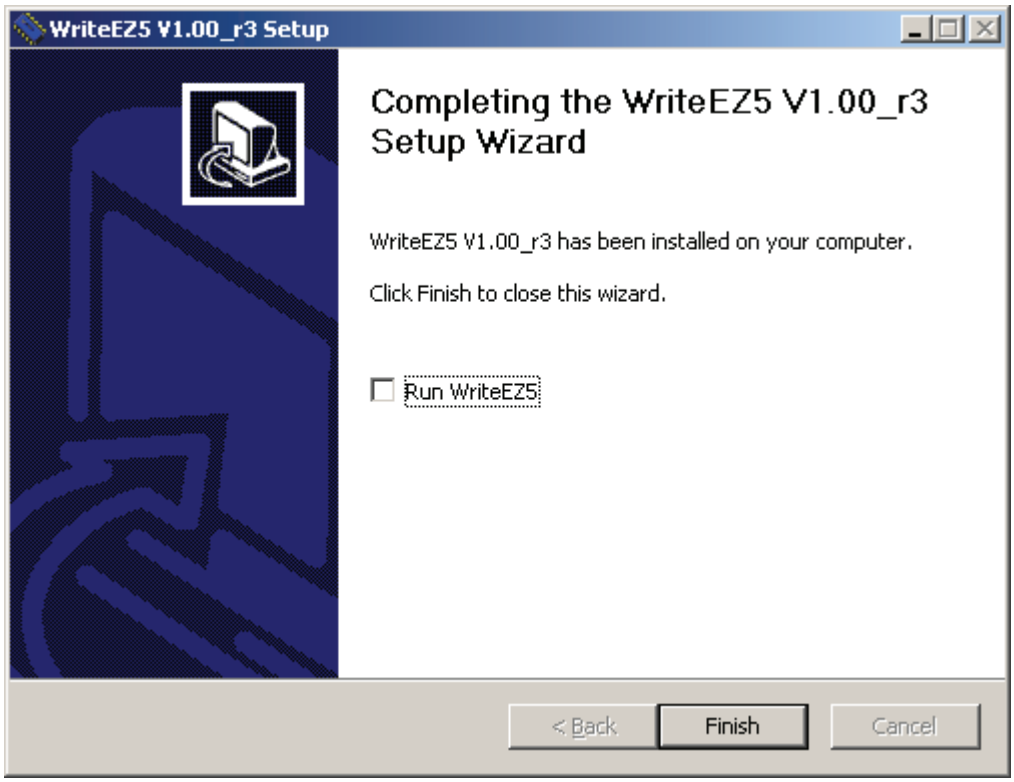
3) Click ‘I Agree’ to confirm that you accept the license agreement.


WriteEZ5 V1.00_r3 Setup
Choose Install Location
Choose the folder in which to install WriteEZ5 V1.00_r3.
RENESAS
Setup will install WriteEZ5 V1.00_r3 in the following folder. To install in a different folder, click Browse and select another folder. Click Install to start the installation.
Destination Folder
C:\Program Files\Renesas Electronics Tools
Browse...
Space required: 2.2MB
Space available: 204.8GB
Nullsoft Install System v2.45
< Back
Install
Cancel

4) Accept the default installation folder or use the ‘Browse’ function to select any other folder of your choice. Click ‘Install’ to start the installation.



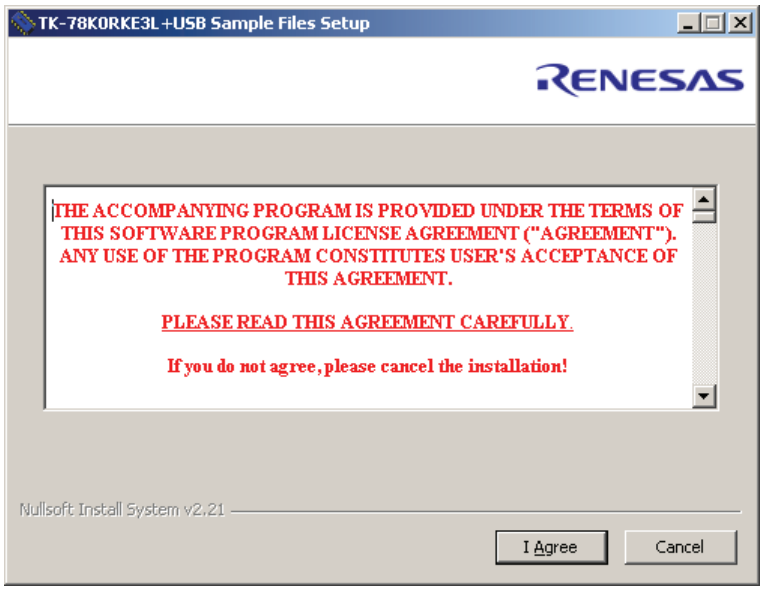
5) Click ‘Next’ to continue the installation.



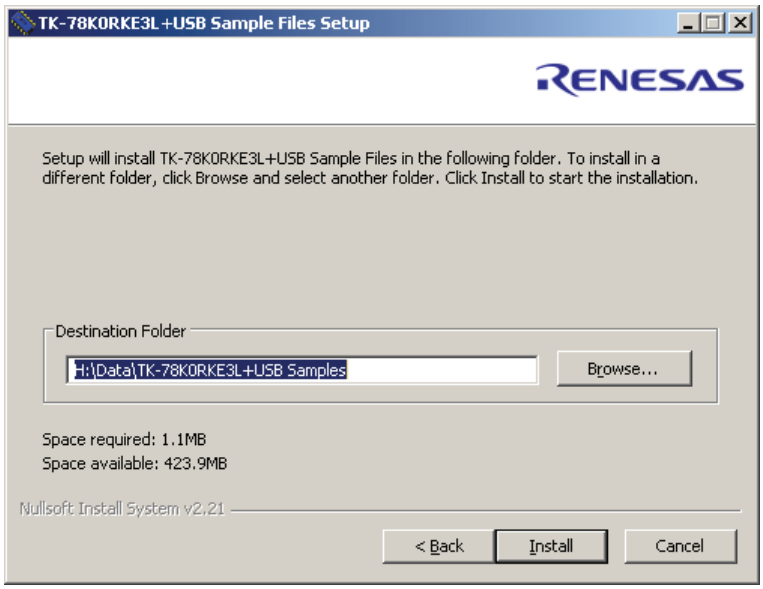
6) As the programmer shall not be started now, please unmark ‘Run WriteEZ5’ and click ‘Finish’ to close the installer.

2.2.4 Installation of Sample Applications

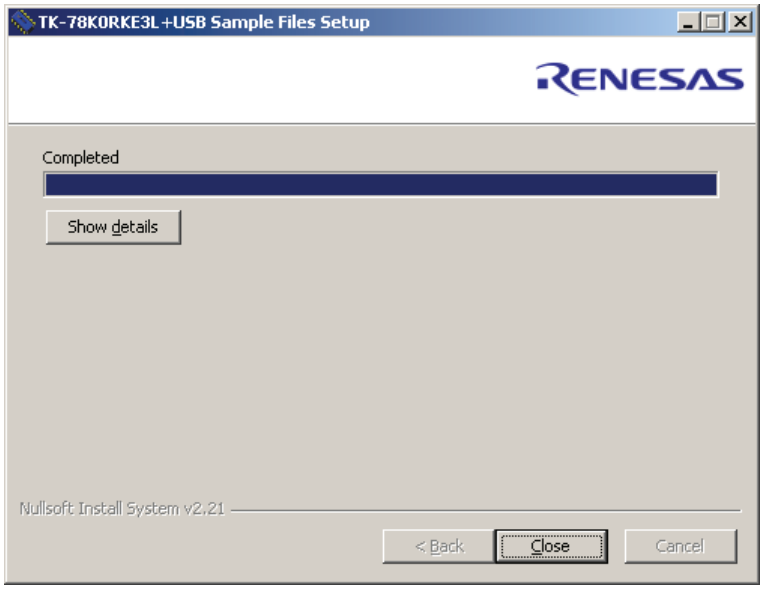
1) Click ‘Install TK-78K0RKE3L+USB’ Sample Programs’.


TK-78K0RKE3L+USB Sample Files Setup
RENESAS
THE ACCOMPANYING PROGRAM IS PROVIDED UNDER THE TERMS OF THIS SOFTWARE PROGRAM LICENSE AGREEMENT ("AGREEMENT"). ANY USE OF THE PROGRAM CONSTITUTES USER'S ACCEPTANCE OF THIS AGREEMENT.
PLEASE READ THIS AGREEMENT CAREFULLY.
If you do not agree, please cancel the installation!
Nullsoft Install System v2.21
I Agree
Cancel

2) Read the license agreement and click ‘I Agree’ to accept the terms.


TK-78K0RKE3L+USB Sample Files Setup
RENESAS
Setup will install TK-78K0RKE3L+USB Sample Files in the following folder. To install in a different folder, click Browse and select another folder. Click Install to start the installation.
Destination Folder
H:\Data\TK-78K0RKE3L+USB Samples
Browse...
Space required: 1.1MB
Space available: 423.9MB
Nullsoft Install System v2,21
< Back
Install
Cancel

3) Please select the installation folder of the samples and click ‘Install’



4) Click ‘Close’ to finish the installation.

2.3 USB Driver Installation

"NEC Electronics Starter Kit Virtual UART" USB driver must be installed on PC before you start using the TK-78K0R/KE3L+USB.

Please, follow the instruction below to install the driver.

"Starter Kit USB Driver" must be installed on the PC. The driver is included in the Embedded Workbench package, please refer to "2.2 Installation of Development Tools" to install the Embedded Workbench first.

CAUTION: Do not use a USB hub for connecting TK-78K0R/KE3L+USB.

First, connect the TK-78K0R/KE3L+USB USB2 to PC with USB cable.

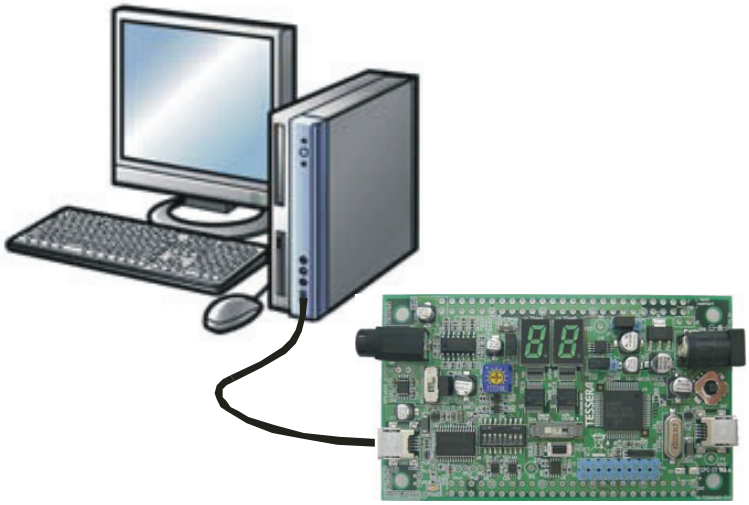


Figure 2 USB Connection

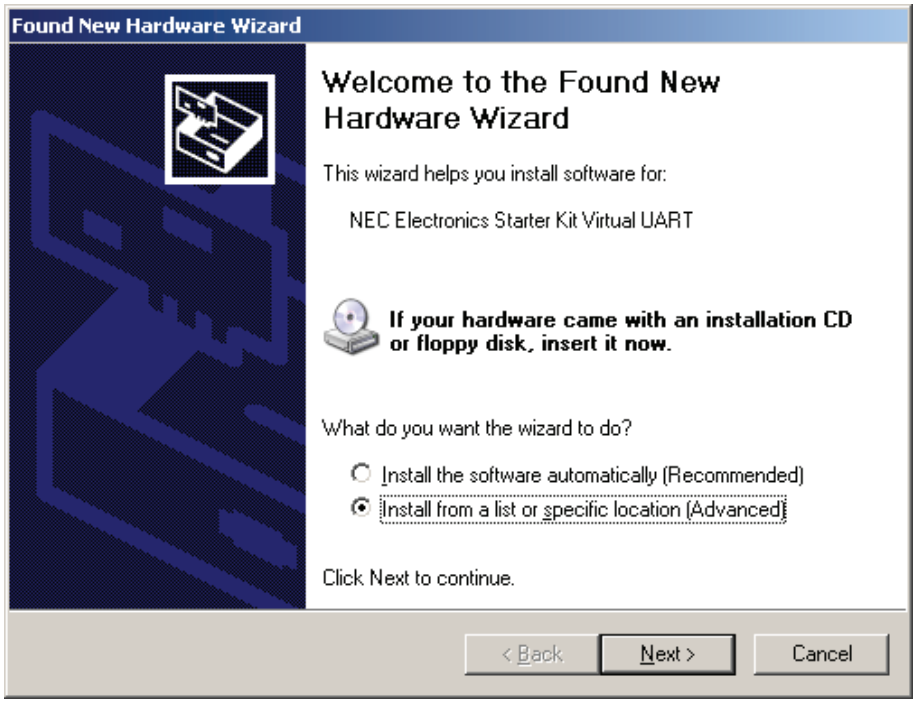
Depending on the version of Windows OS, the installation will be differed. Please check your Windows version, and follow the instructions

- Windows XP -> Chapter 2.3.1 Installation on Windows XP

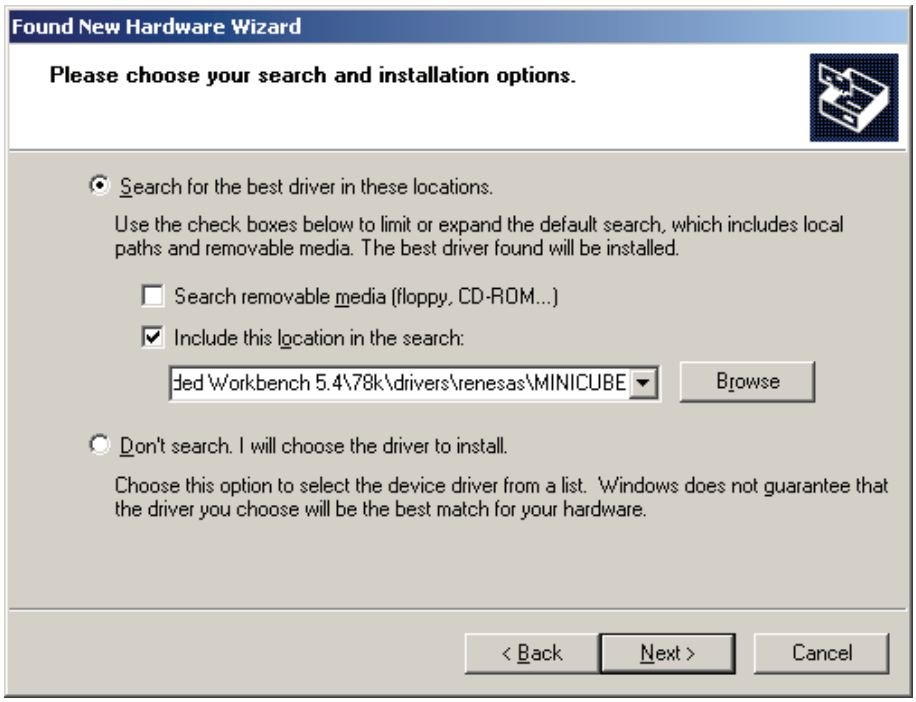
- Windows 2000-> Chapter 2.3.2 Installation on Windows 2000

After the installation, go to Chapter 2.3.3 Completion of USB Driver Installation

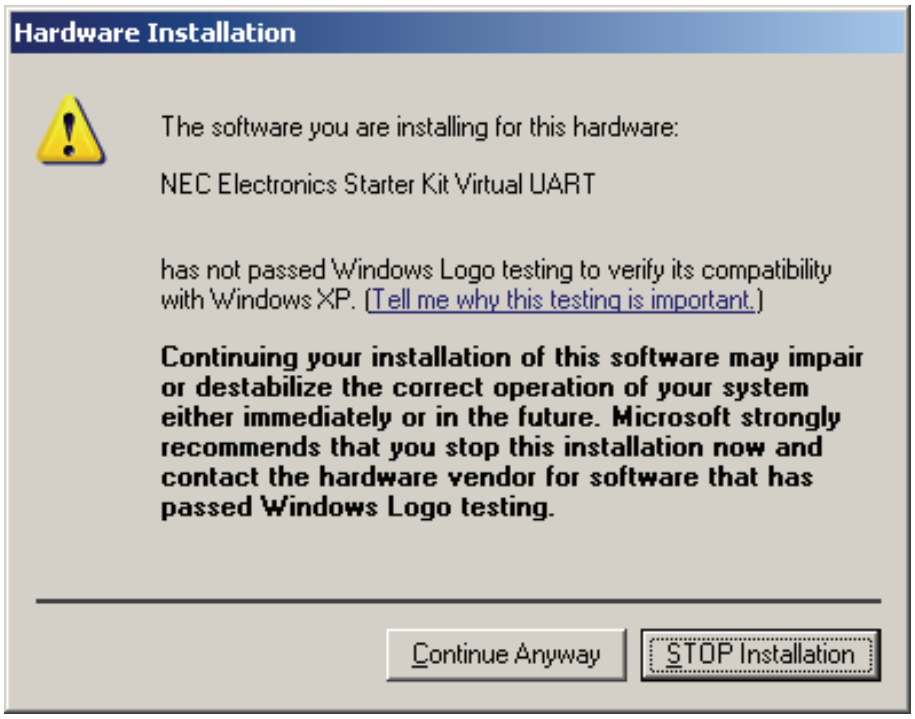
2.3.1 Installation on Windows XP


Found New Hardware Wizard
Welcome to the Found New Hardware Wizard
This wizard helps you install software for:
NEC Electronics Starter Kit Virtual UART
If your hardware came with an installation CD or floppy disk, insert it now.
What do you want the wizard to do?
Install the software automatically (Recommended)
Install from a list or specific location (Advanced)
Click Next to continue.
< Back
Next >
Cancel

1) Select ‘Install from a list or a specific location (Advanced)’ and click ‘Next’.


Found New Hardware Wizard
Please choose your search and installation options.
Search for the best driver in these locations.
Use the check boxes below to limit or expand the default search, which includes local paths and removable media. The best driver found will be installed.
Search removable media (floppy, CD-ROM...)
Include this location in the search:
ded Workbench 5.4\78k\drivers\renesas\MINICUBE
Browse
Don't search. I will choose the driver to install.
Choose this option to select the device driver from a list. Windows does not guarantee that the driver you choose will be the best match for your hardware.
< Back
Next >
Cancel

2) Mark ‘Include this location in the search’ and select the subfolder ‘78Kdrivers/renesas/MINICUBE’ of your Embedded Workbench installation folder. Click ‘Next’


Hardware Installation
The software you are installing for this hardware:
NEC Electronics Starter Kit Virtual UART
has not passed Windows Logo testing to verify its compatibility with Windows XP. (Tell me why this testing is important.)
Continuing your installation of this software may impair or destabilize the correct operation of your system either immediately or in the future. Microsoft strongly recommends that you stop this installation now and contact the hardware vendor for software that has passed Windows Logo testing.
Continue Anyway
STOP Installation

3) Click ‘Continue Anyway’ to continue the installation.

Found New Hardware Wizard
Completing the Found New Hardware Wizard
The wizard has finished installing the software for:
NEC Electronics Starter Kit Virtual UART
Click Finish to close the wizard.
< Back
Finish
Cancel

4) Click ‘Finish’ to close the installation wizard.

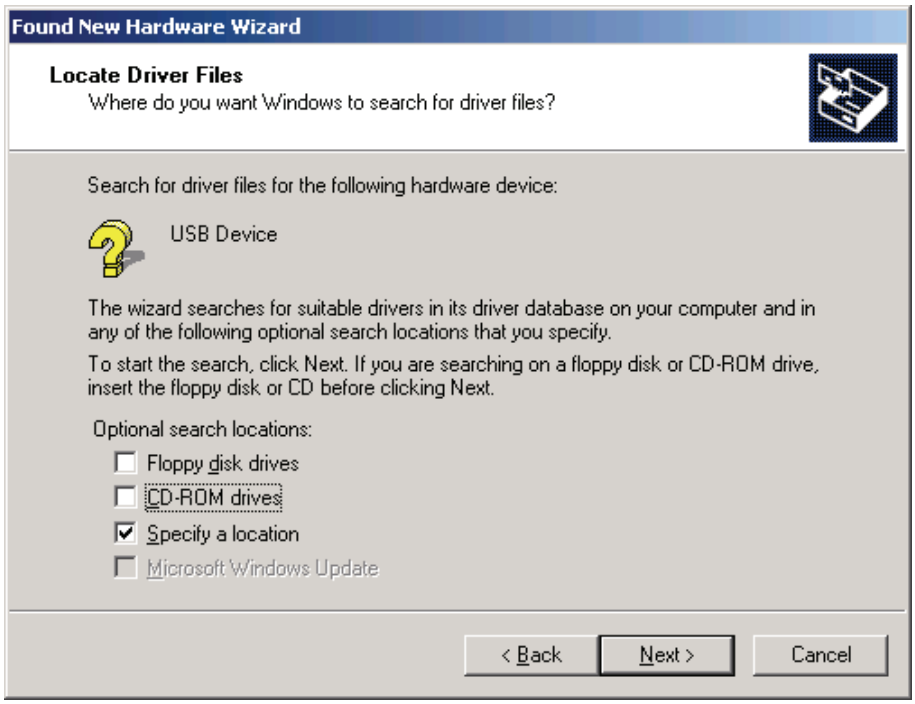
2.3.2 Installation on Windows 2000

Found New Hardware Wizard
Welcome to the Found New Hardware Wizard
This wizard helps you install a device driver for a hardware device.
To continue, click Next.
< Back
Next >
Cancel

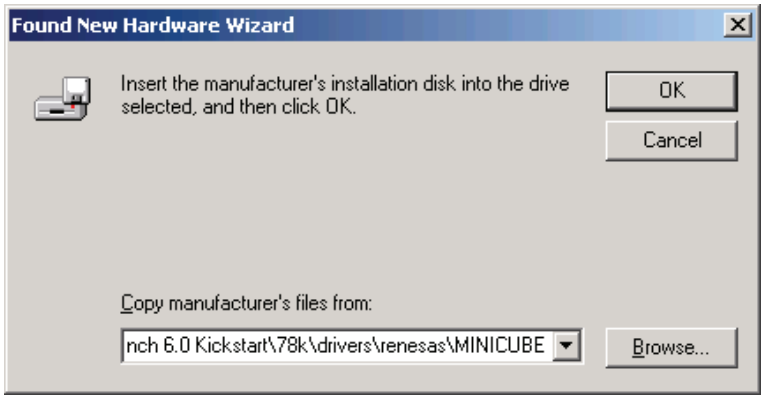
1) Click ‘Next’ to continue.

Found New Hardware Wizard
Install Hardware Device Drivers
A device driver is a software program that enables a hardware device to work with an operating system.
This wizard will complete the installation for this device:
USB Device
A device driver is a software program that makes a hardware device work. Windows needs driver files for your new device. To locate driver files and complete the installation click Next.
What do you want the wizard to do?
Search for a suitable driver for my device (recommended)
Display a list of the known drivers for this device so that I can choose a specific driver
< Back
Next >
Cancel

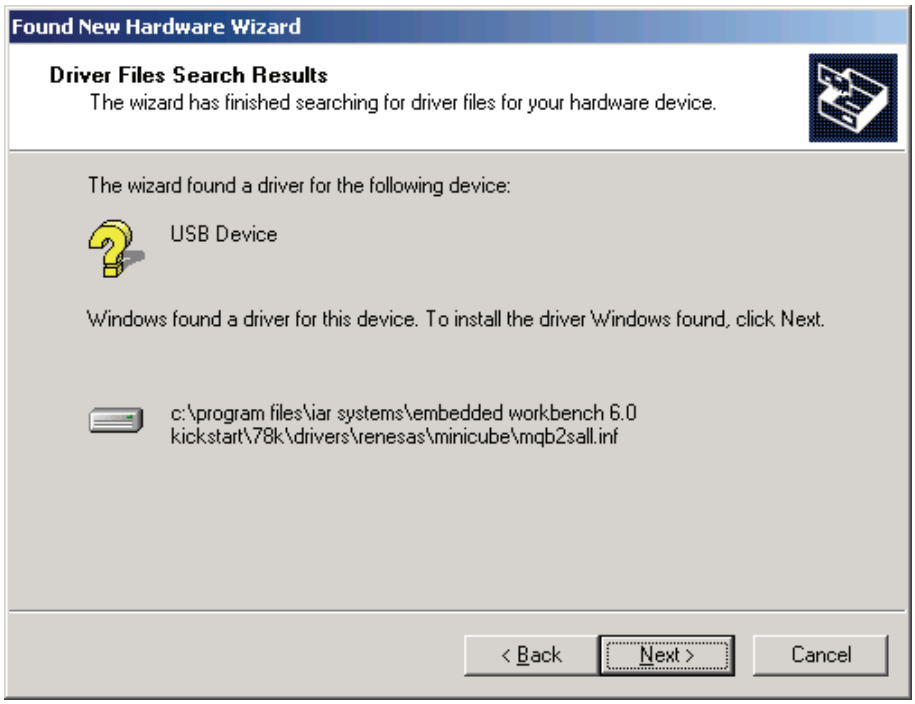
2) Select ‘Search for a suitable driver for my device’ and click ‘Next’


Found New Hardware Wizard
Locate Driver Files
Where do you want Windows to search for driver files?
Search for driver files for the following hardware device:
USB Device
The wizard searches for suitable drivers in its driver database on your computer and in any of the following optional search locations that you specify.
To start the search, click Next. If you are searching on a floppy disk or CD-ROM drive, insert the floppy disk or CD before clicking Next.
Optional search locations:
Floppy disk drives
CD-ROM drives
Specify a location
Microsoft Windows Update
< Back
Next >
Cancel

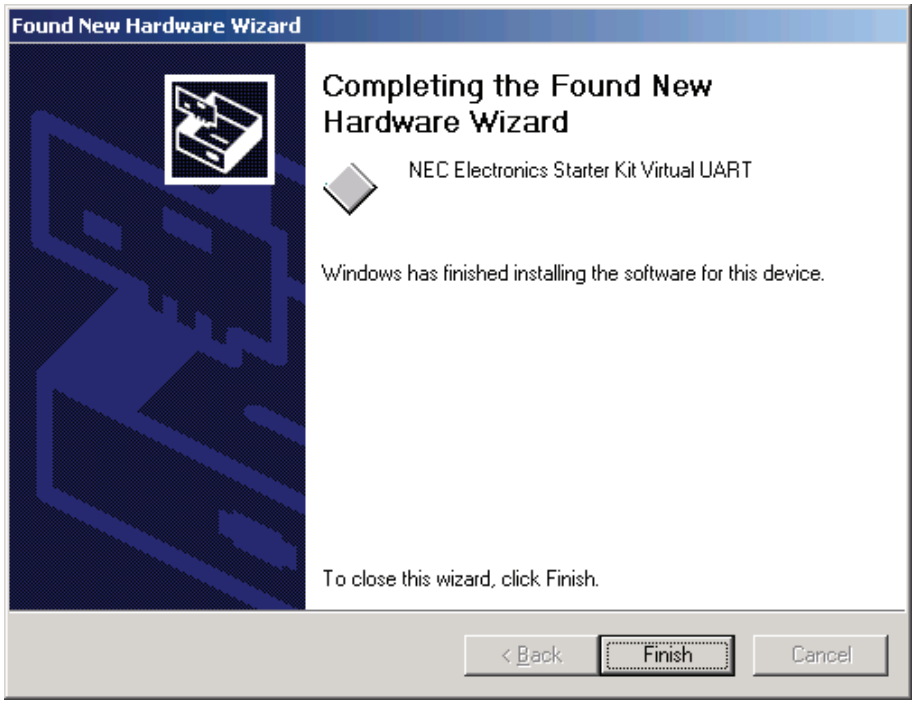
3) Mark ‘Specify a location’ and click ‘Next’



4) Select the subfolder ‘78Kdrivers/renesas/MINICUBE’ of your Embedded Workbench installation folder using the ‘Browse’-function and click ‘OK’.


Found New Hardware Wizard
Driver Files Search Results
The wizard has finished searching for driver files for your hardware device.
The wizard found a driver for the following device:
USB Device
Windows found a driver for this device. To install the driver Windows found, click Next.
c:\program files\iar systems\embedded workbench 6.0 kickstart\78k\drivers\renesas\minicube\mqb2sall.inf
< Back
Next >
Cancel

5) Confirm the found driver by clicking ‘Next’


Found New Hardware Wizard
Completing the Found New Hardware Wizard
NEC Electronics Starter Kit Virtual UART
Windows has finished installing the software for this device.
To close this wizard, click Finish.
< Back
Finish
Cancel

6) Click ‘Finish’ to close the installation wizard.

2.3.3 Completion of USB Driver Installation

Check that the USB driver is installed correctly.

Start "Device Manager", and find "NEC Electronics Starter Kit Virtual UART" (without "?" mark) under the "Ports (COM & LPT)".

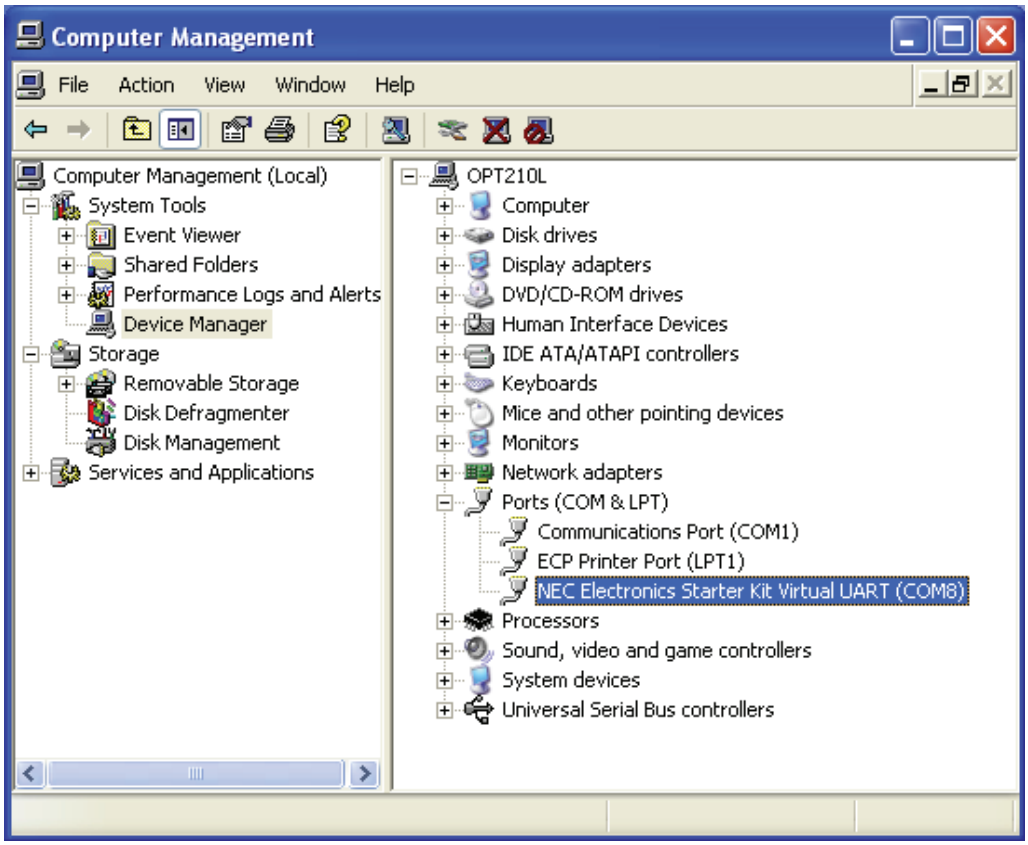


Figure 3 Device Manager Entry

The screen above shows that the COM port number is "COM8". If IC-Spy is not in use, you can use this port number for connecting TK-78K0R/KE3L+USB.

When you change the USB port connection, the COM port number will be changed as well.

CAUTION

Do not do “Hardware Modification Scan” when you communicate with the target device.

2.4 Sample Programs

This section explains the overview and preparation of sample programs. For details about the sample programs, see the two corresponding application notes:

Application Note USB HID (Human Interface Device) Class Driver

Application Note USB CDC (Communication Device Class) Driver

The sample programs consist of following directories:

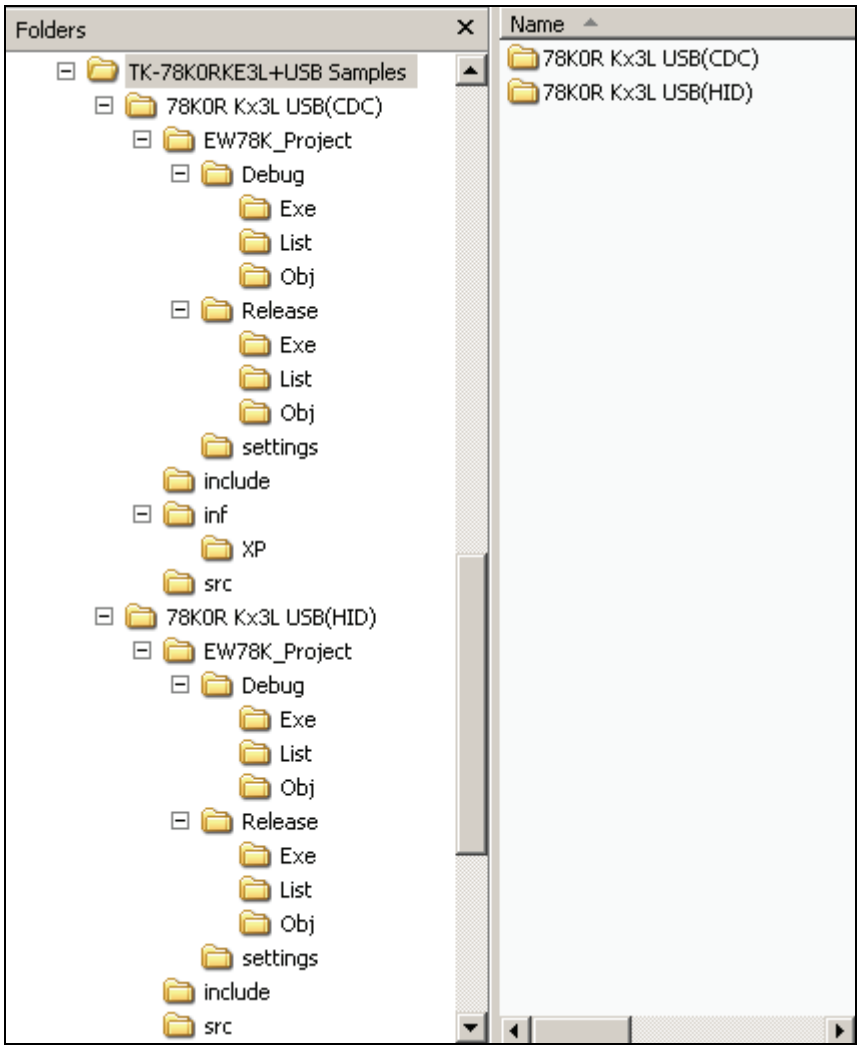


Figure 4 Sample Directories

include:	include file folder
src:	source file folder
EW78K_project:	project file folder (*.ewp: project file, *.eww Workspace file)
inf:	CDC USB driver folder

Chapter 3 Experiences

In this chapter, you will experience how to use the development tools with using the sample programs. The development tools are:

- Integrated Development Environment (IDE), Embedded Workbench for 78K
- Integrated Debugger, C-Spy for 78K

You will use the programs that you prepared in "2.2.4 Installation of Sample Applications", as the sample programs for TK-78K0R/KE3L+USB. You will be able to understand how to use the development tools and the concept of project files which you need for producing application programs.

The overall steps are as follows:

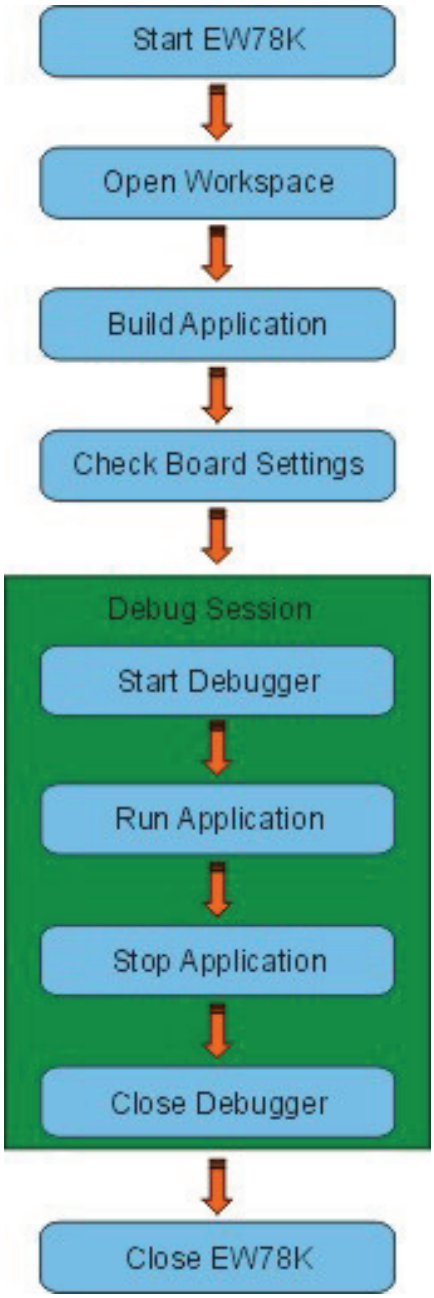


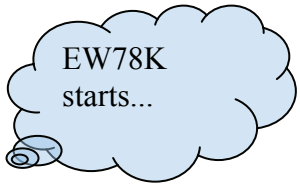
Figure 5 Overall Steps to Start a Debug Session

3.1 Start Embedded Workbench for 78K

Let's start using the development tools.

First, start the Embedded Workbench

Select "Windows Start Menu" -> "Program" -> "IAR Systems" -> "Embedded Workbench for Renesas 78K V4.70 Kickstart".



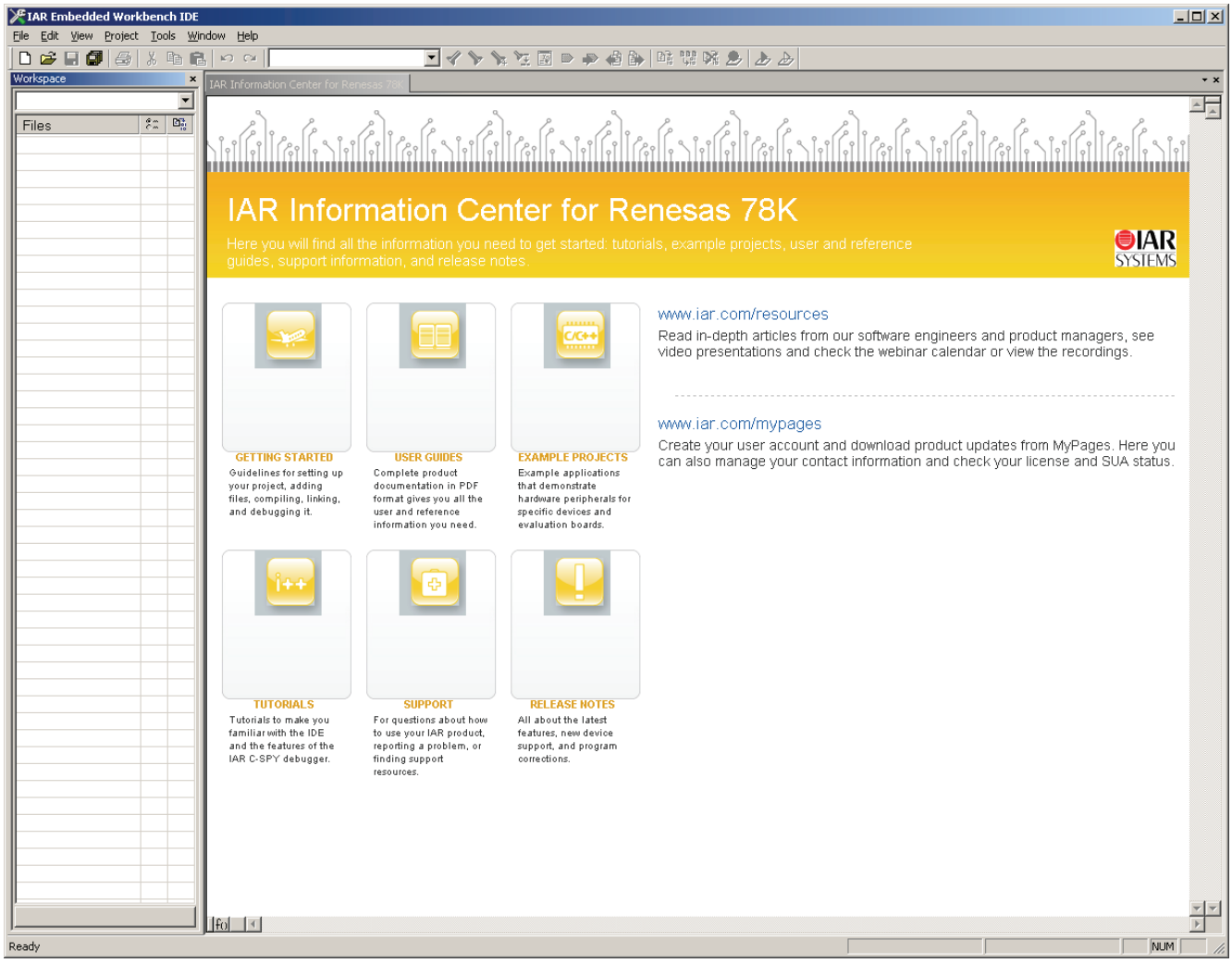

IAR Embedded Workbench IDE
File Edit View Project Tools Window Help
Workspace
Files
IAR Information Center for Renesas 78K
Here you will find all the information you need to get started: tutorials, example projects, user and reference guides, support information, and release notes.
IAR SYSTEMS
GETTING STARTED
Guidelines for setting up your project, adding files, compiling, linking, and debugging it.
USER GUIDES
Complete product documentation in PDF format gives you all the user and reference information you need.
EXAMPLE PROJECTS
Example applications that demonstrate hardware peripherals for specific devices and evaluation boards.
www.iar.com/resources
Read in-depth articles from our software engineers and product managers, see video presentations and check the webinar calendar or view the recordings.
www.iar.com/mypages
Create your user account and download product updates from MyPages. Here you can also manage your contact information and check your license and SUA status.
TUTORIALS
Tutorials to make you familiar with the IDE and the features of the IAR C-SPY debugger.
SUPPORT
For questions about how to use your IAR product, reporting a problem, or finding support resources.
RELEASE NOTES
All about the latest features, new device support, and program corrections.
Ready
NUM

Figure 6 EW78K Start-Up

3.2 What is 'Embedded Workbench for 78K' ?

In EW78K, application programs and environment setting are handled as a single project, and series of actions such as program creation using the editor, source management, build, and debugging are managed. One or more projects can be combined in one workspace. The same project may also be included in different workspaces. A workspace is a collection of projects containing on information about the configuration of each project.

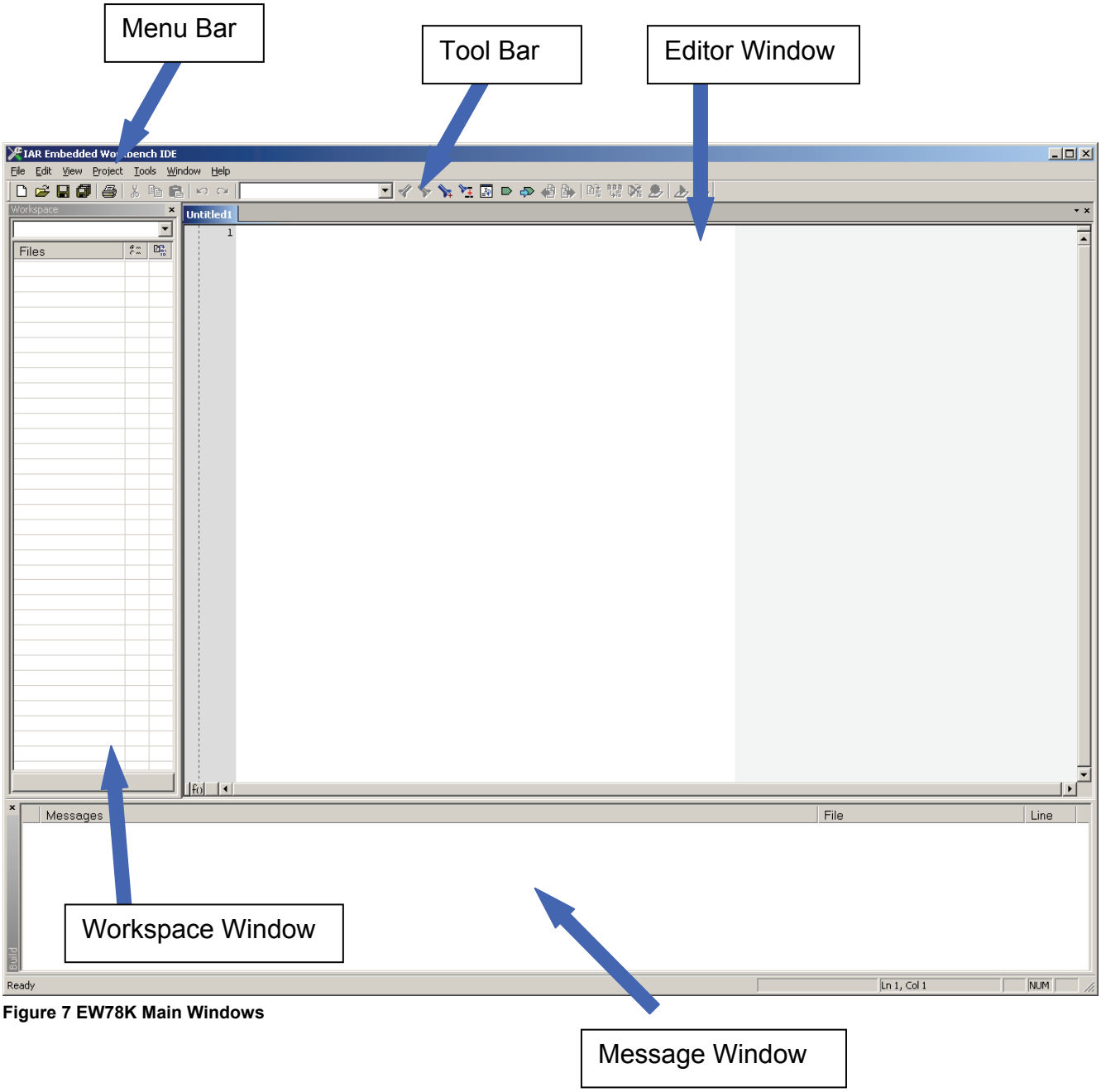


Figure 7 EW78K Main Windows

Workspace window: A window in which project names, source files, include file and generated output files are displayed using a tree structure.

Message window: A window in which the build execution messages are displayed.

Editor window: A window to create all kind of source files.

What is a project?

A project is the unit that is managed by EW78K. A project refers to an application system and environment development based on EW78K. EW78K saves project information in a "project file".

What is a project file?

A project file contains project information that includes the source files, device name, tool options for compiler, assembler, linker and debugger. The file name format is "xxxxx.ewp".

Project files are created in the directory you specify when creating a new project.

What is a workspace?

A workspace is the unit used to manage all the projects required for one application system.

A workspace file contains one or more project files. The file name format is "xxxxx.eww".

Workspace files are created in the directory you specify when creating a new project.

3.3 Open Workspace

In this section, you will use the workspace that you created in "2.2.4 Installation of Sample Applications"

For creating a new workspace, refer to "Chapter 6 Other Information".

Select ‘File -> Open -> Workspace…’ on the menu bar.

Then, select " 78K0R_Kx3L(HID).eww " under the directory " TK-78K0RKE3L+USB\Samples78K0R Kx3L USB(HID) \EW78K_Project".

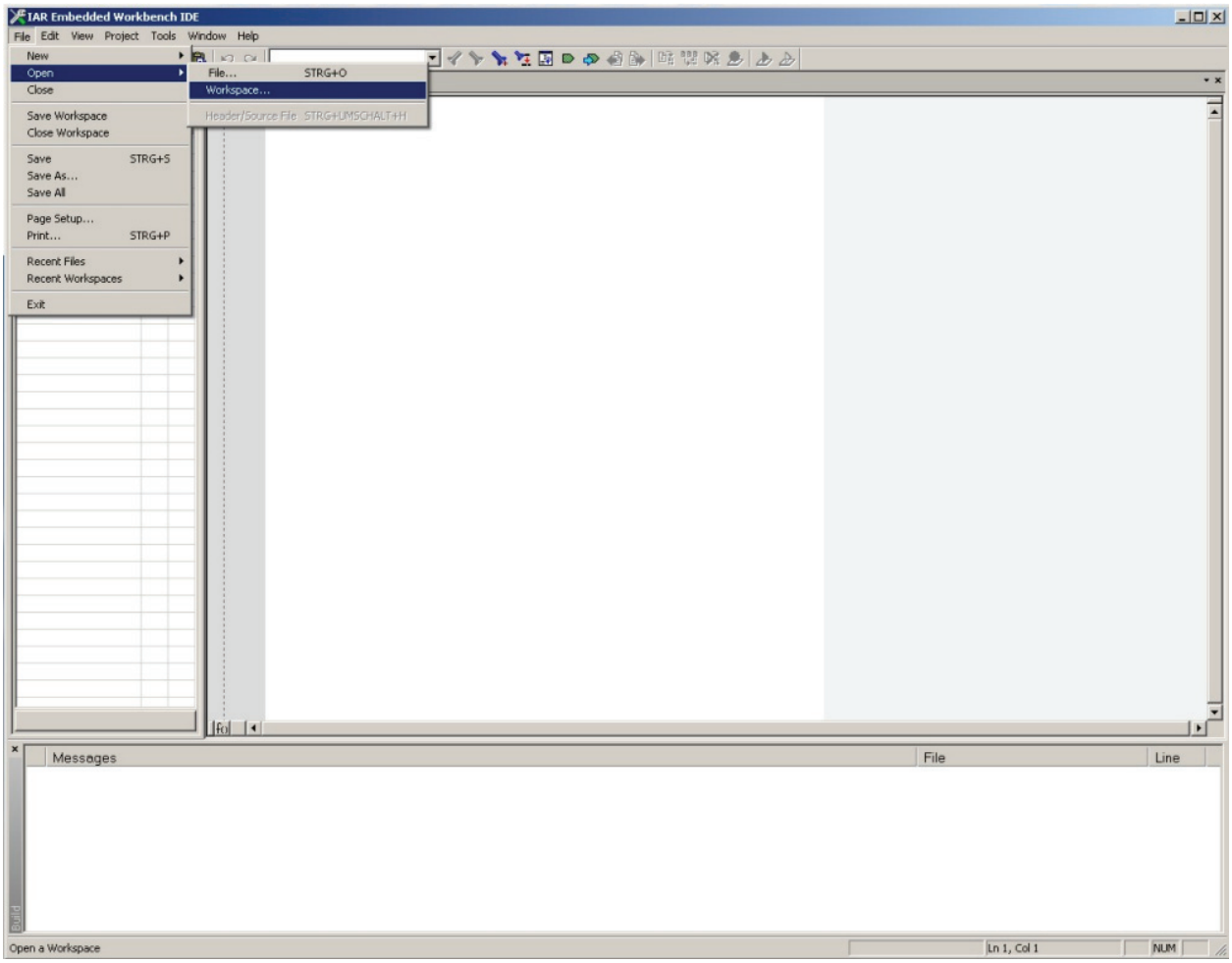


Figure 8 EW78K Open Workspace

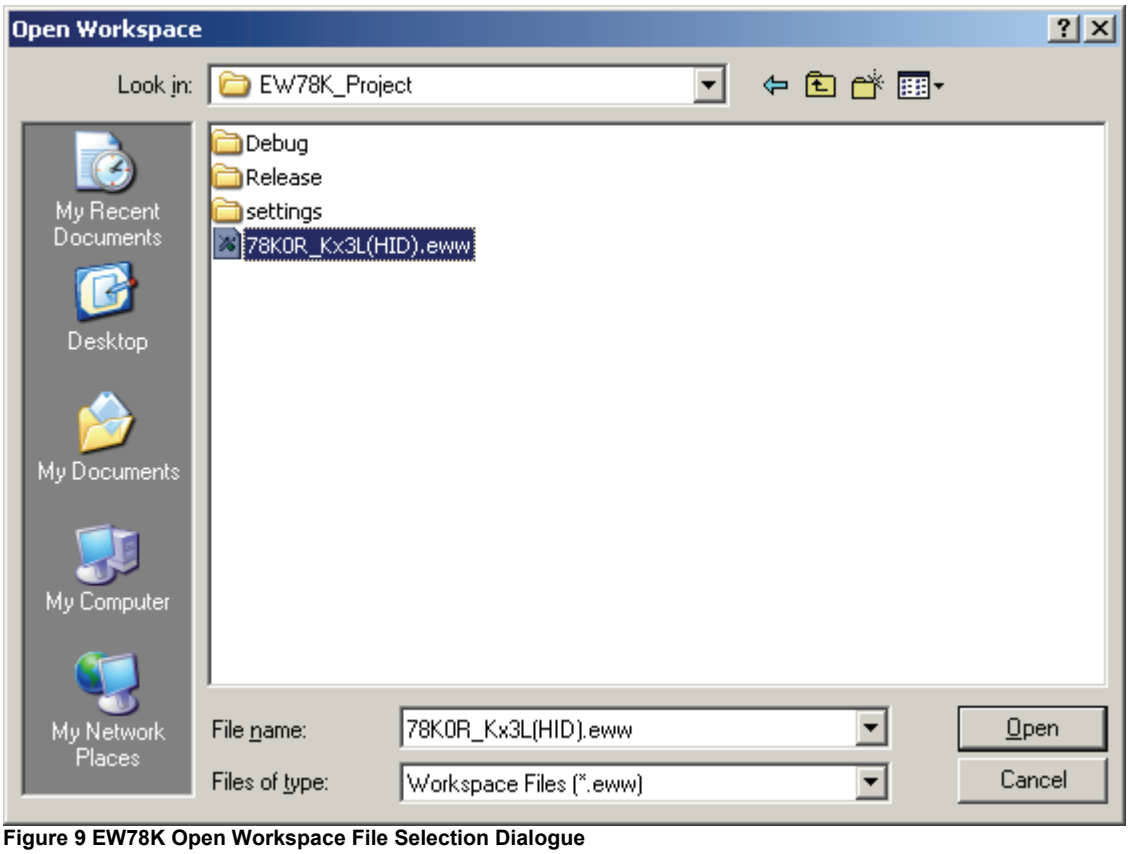


Figure 9 EW78K Open Workspace File Selection Dialogue

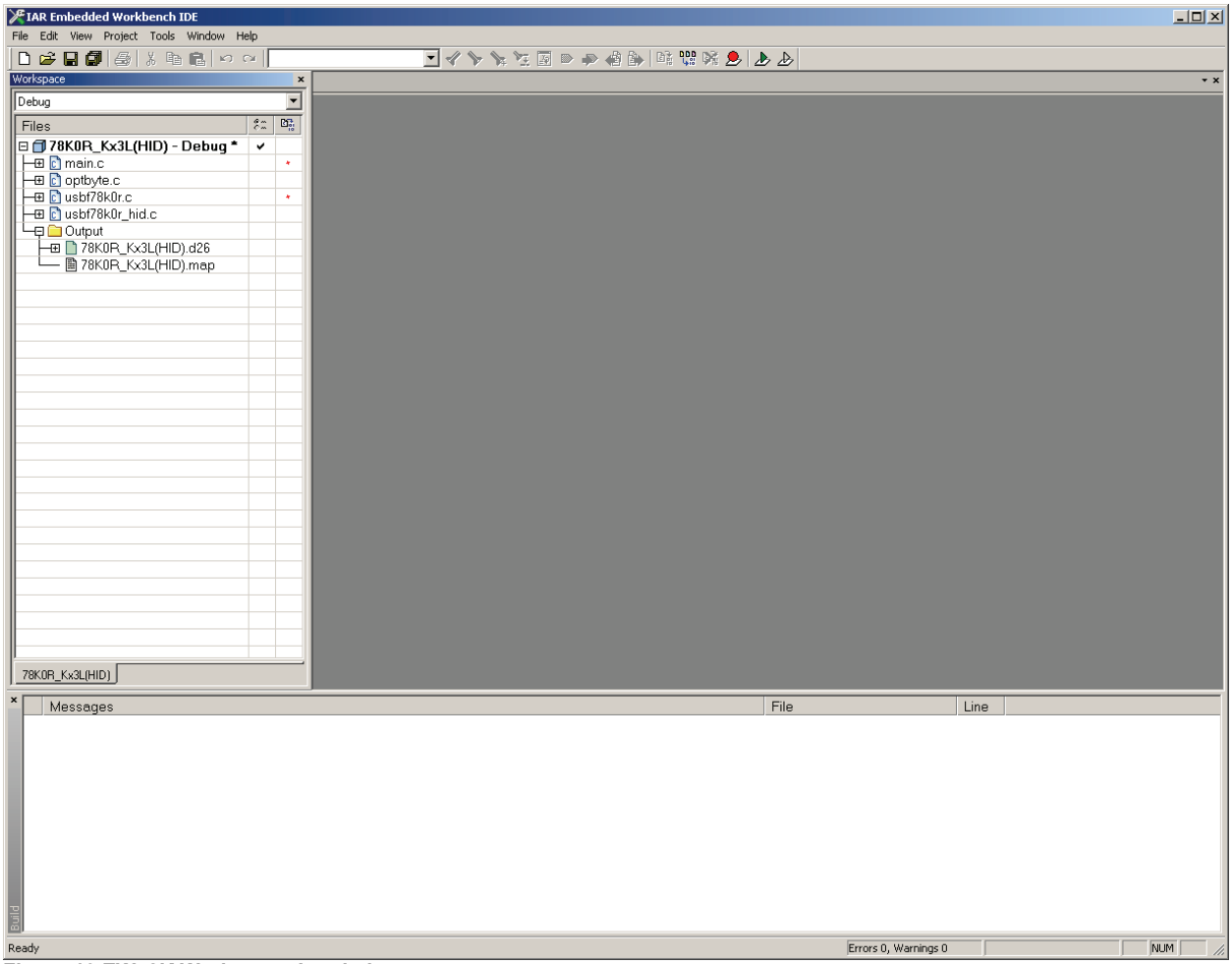


Figure 10 EW78K Workspace Loaded

3.4 Build Application

To build the application use either the ‘Make’ button of the tool bar, select the menu item ‘Project -> Make’ or use the keyboard and press ‘F7’ key.

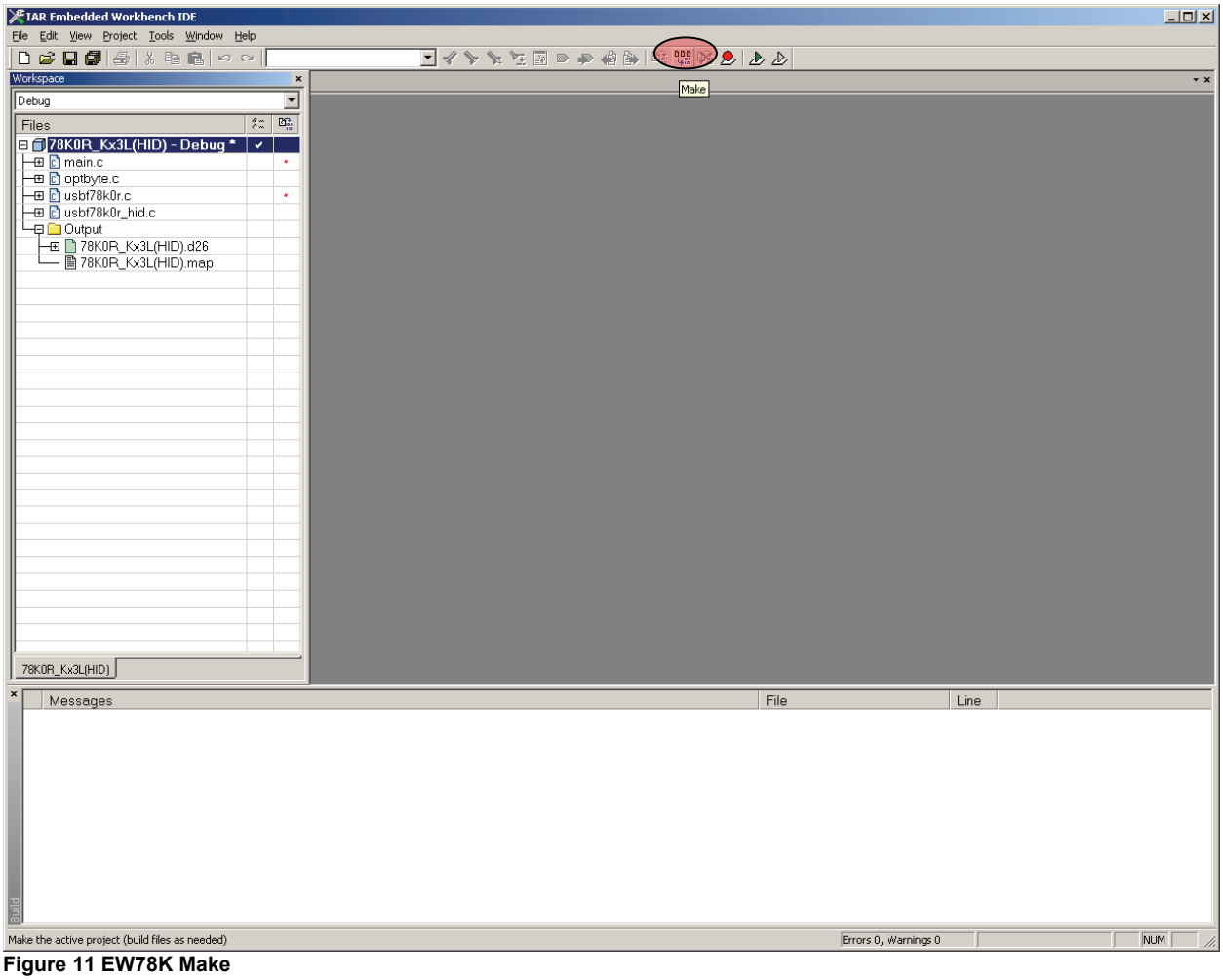


Figure 11 EW78K Make

All build messages can be seen in the Messages Window.

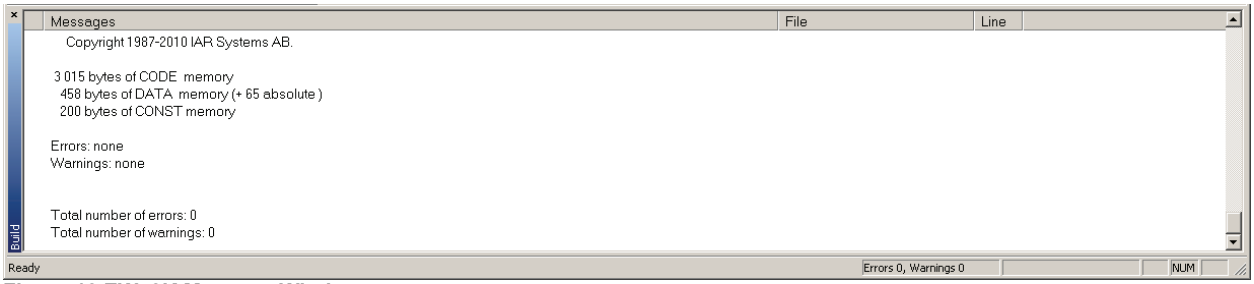


Figure 12 EW78K Message Window

What is the difference between Make and Rebuild?

Make and Rebuild are functions creating an executable file from source files in a project. Compiling, assembling, linking, and other processing actions are performed automatically. To reduce the time for the build, make detects and compiles/assembles only the files that have been updated from the previous build process, whereas rebuild compiles and assembles all the source files.

3.5 Tool Configuration

After getting familiar with the development environment you can modify the configuration according to your needs. All options for the assembler, compiler, linker, and debugger can be modified in the menu ‘Project->Options’.

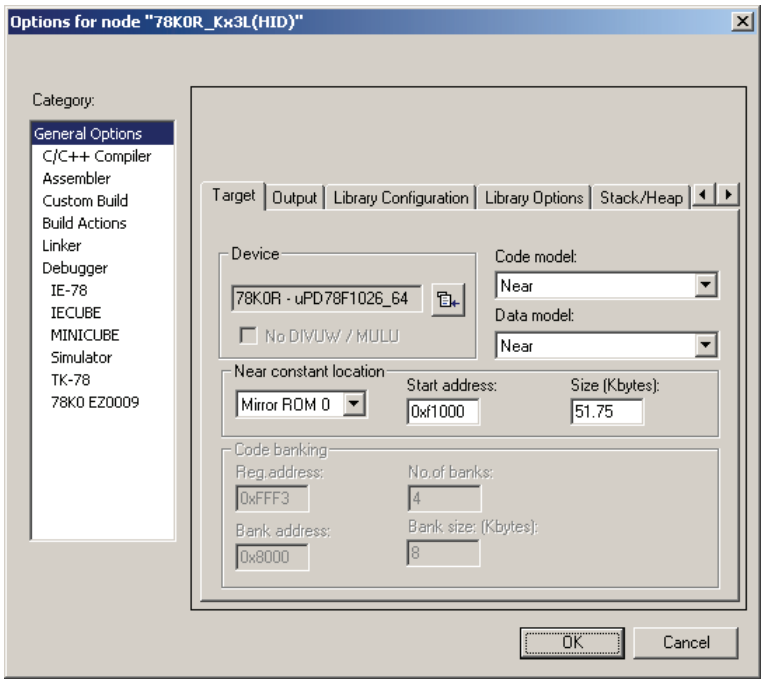


Figure 13 EW78K General Project Options

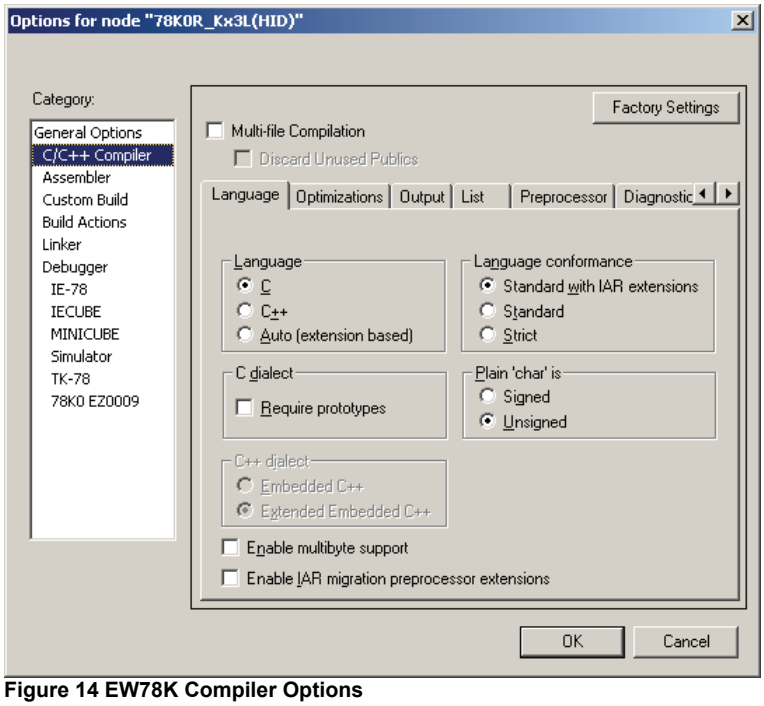


Figure 14 EW78K Compiler Options

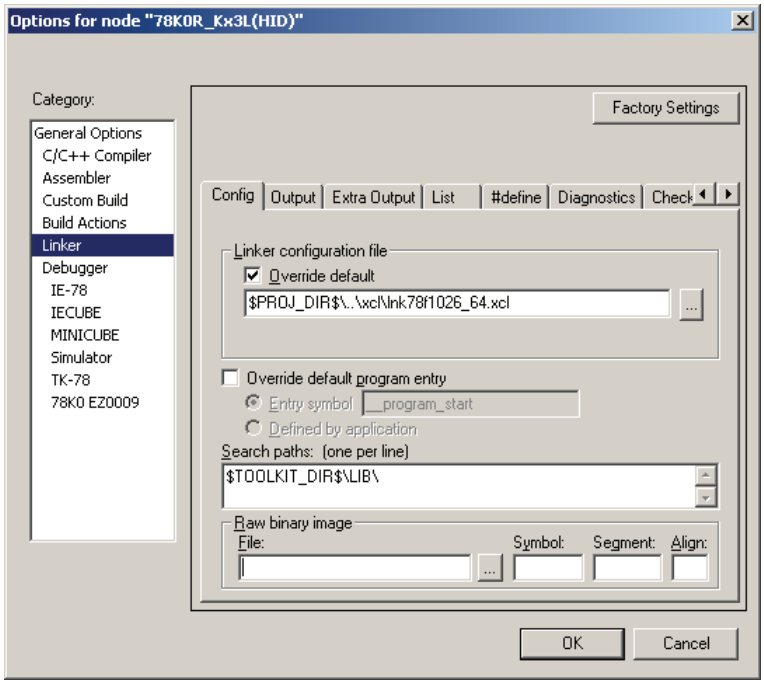


Figure 15 EW78K Linker Options

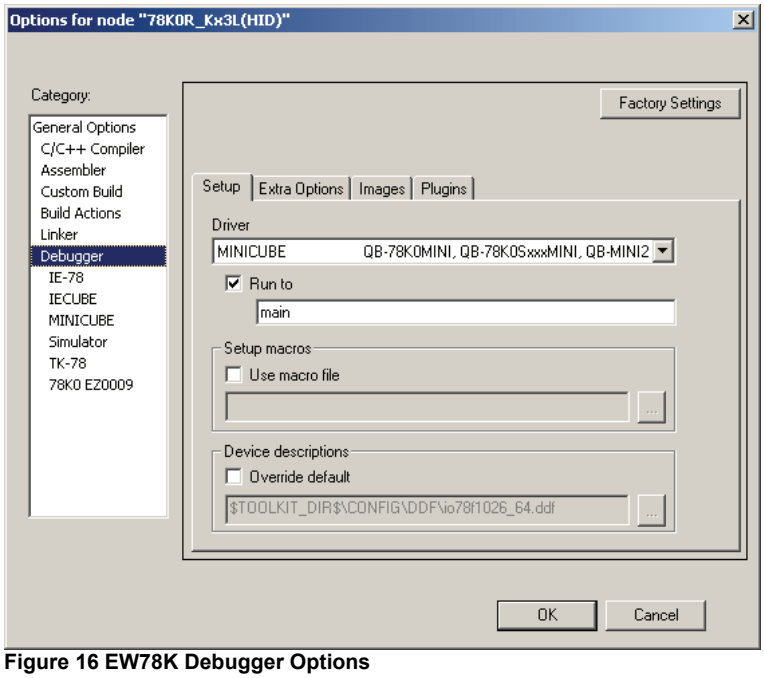


Figure 16 EW78K Debugger Options

3.6 Check Board Settings

Before connecting the PC and the TK-78K0R/KE3L+USB with USB, you should check the setting of switch and jumper pin on the board. Set the switch and the jumper pin on the TK-78K0R/KE3L+USB as follows.

Jumper	Position
JP1	short
JP2	1-2 short
JP3	1-2 short
JP4	Short
SW4	Debug Writer

Table 2 TK-78K0RKE3L+USB Jumper Setting

SW1							
1	2	3	4	5	6	7	8
ON	ON	ON	ON	ON	OFF	OFF	OFF

Table 3 TK-78K0RKE3L+USB Switch SW1 Setting

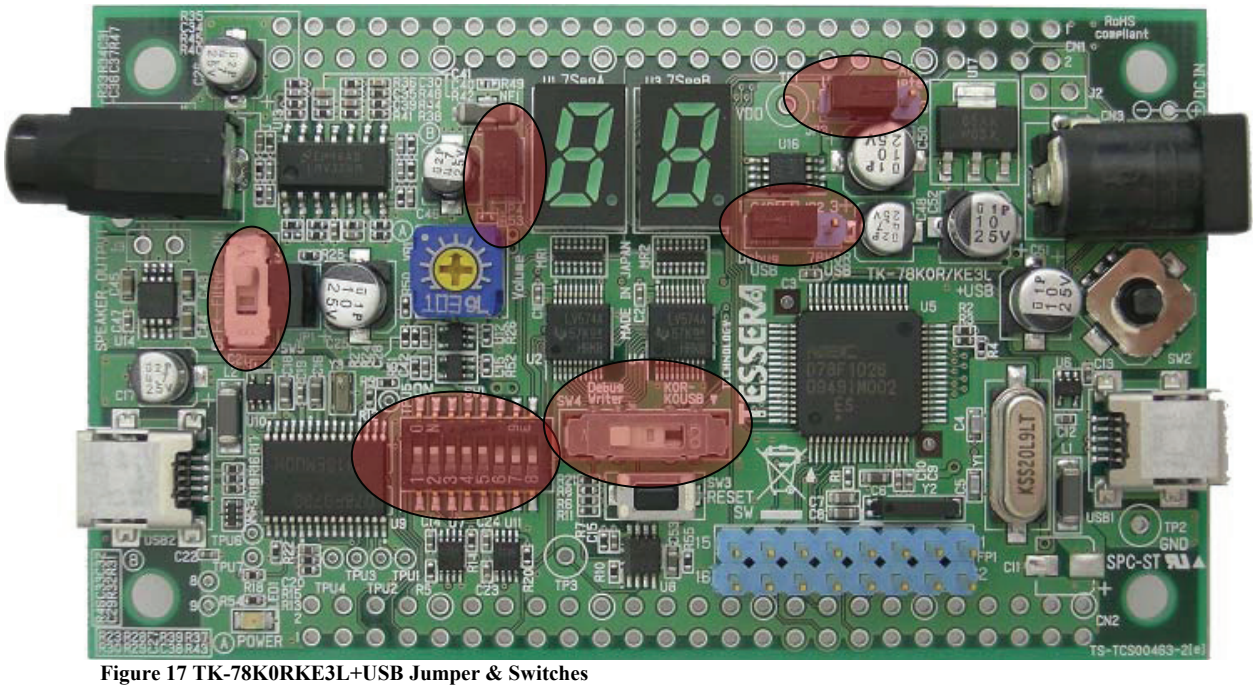


Figure 17 TK-78K0RKE3L+USB Jumper & Switches

After the switch settings are completed, connect the PC to USB2 on TK-78K0R/KE3L+USB with USB cable. If the "Found New Hardware Wizard" is started, install USB driver with referring "2.3 USB Driver Installation".

3.7 Start C-Spy Debug Session

To start the C-Syp debugger use either the ‘Download and Debug’ button of the tool bar, or select the menu item ‘Project -> Download and Debug’ or use the keyboard and press ‘STRG+D’.

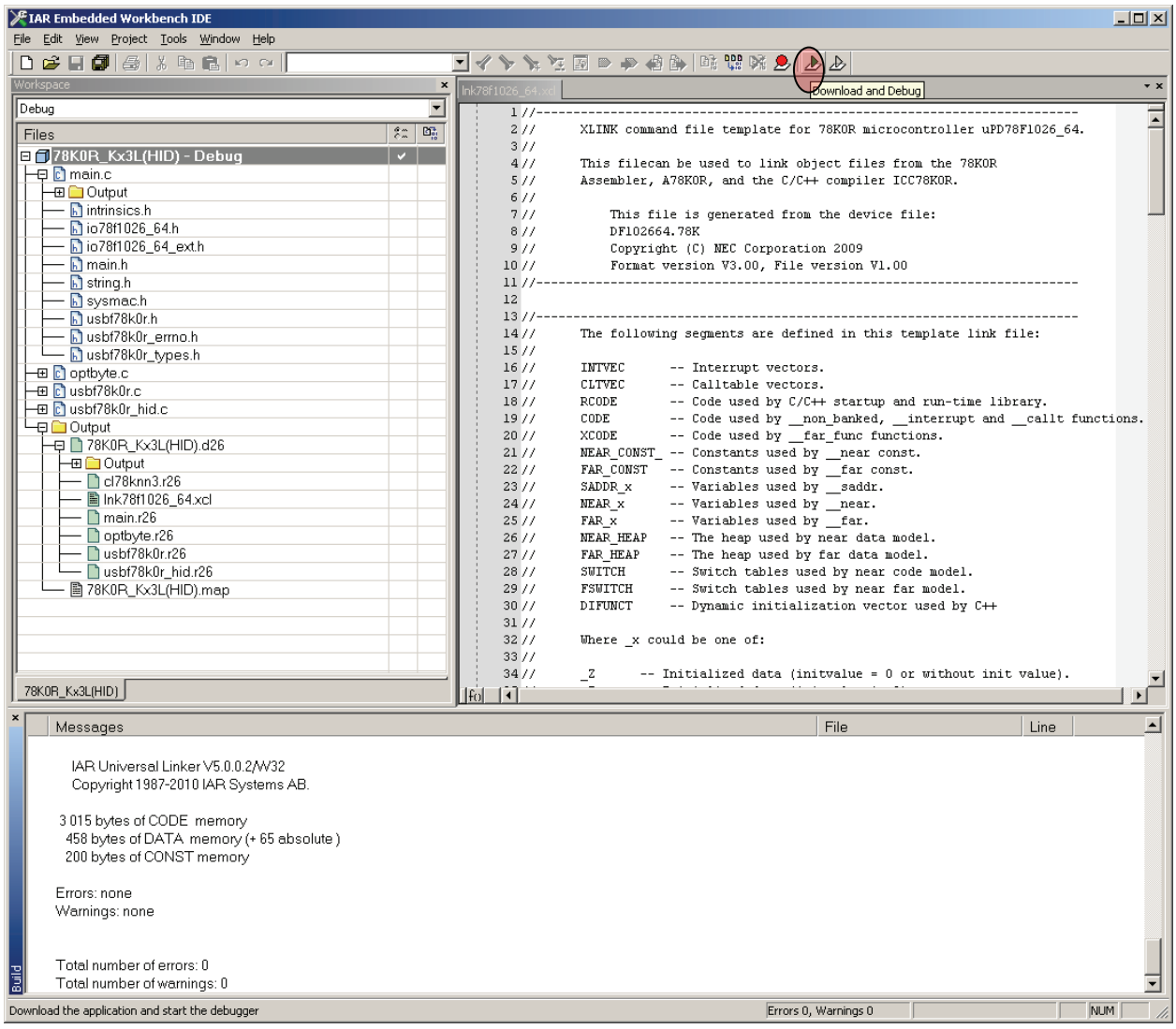


Figure 18: IAR Embedded Workbench Download and Debug

In case of starting a debug session for the first time, the following C-Spy Hardware Setup Dialogue is opened automatically. Later you can modify the configuration only in the debug session selecting the menu ‘ Emulator->Hardware Setup…’.

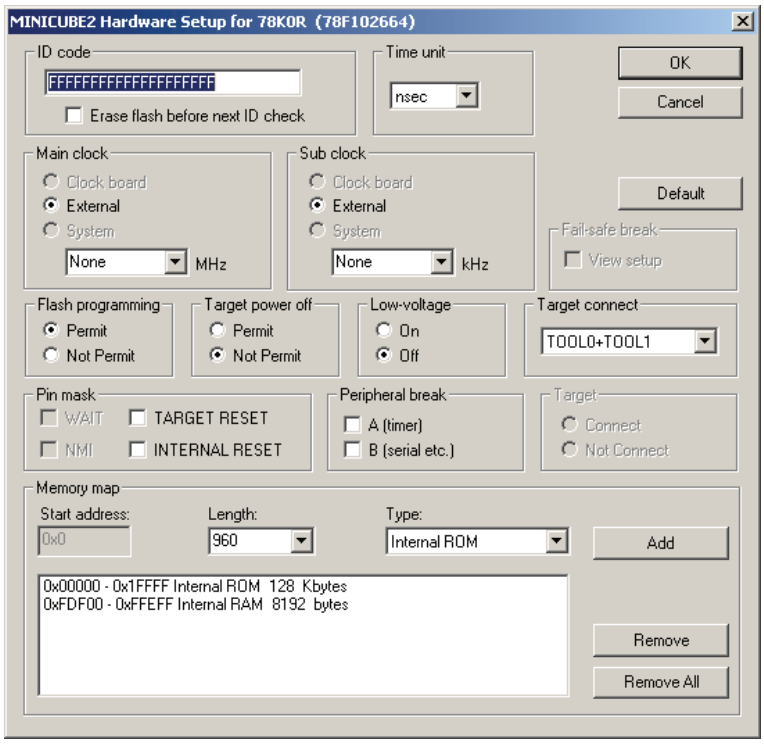


Figure 19 C-Spy Hardware Setup Dialogue

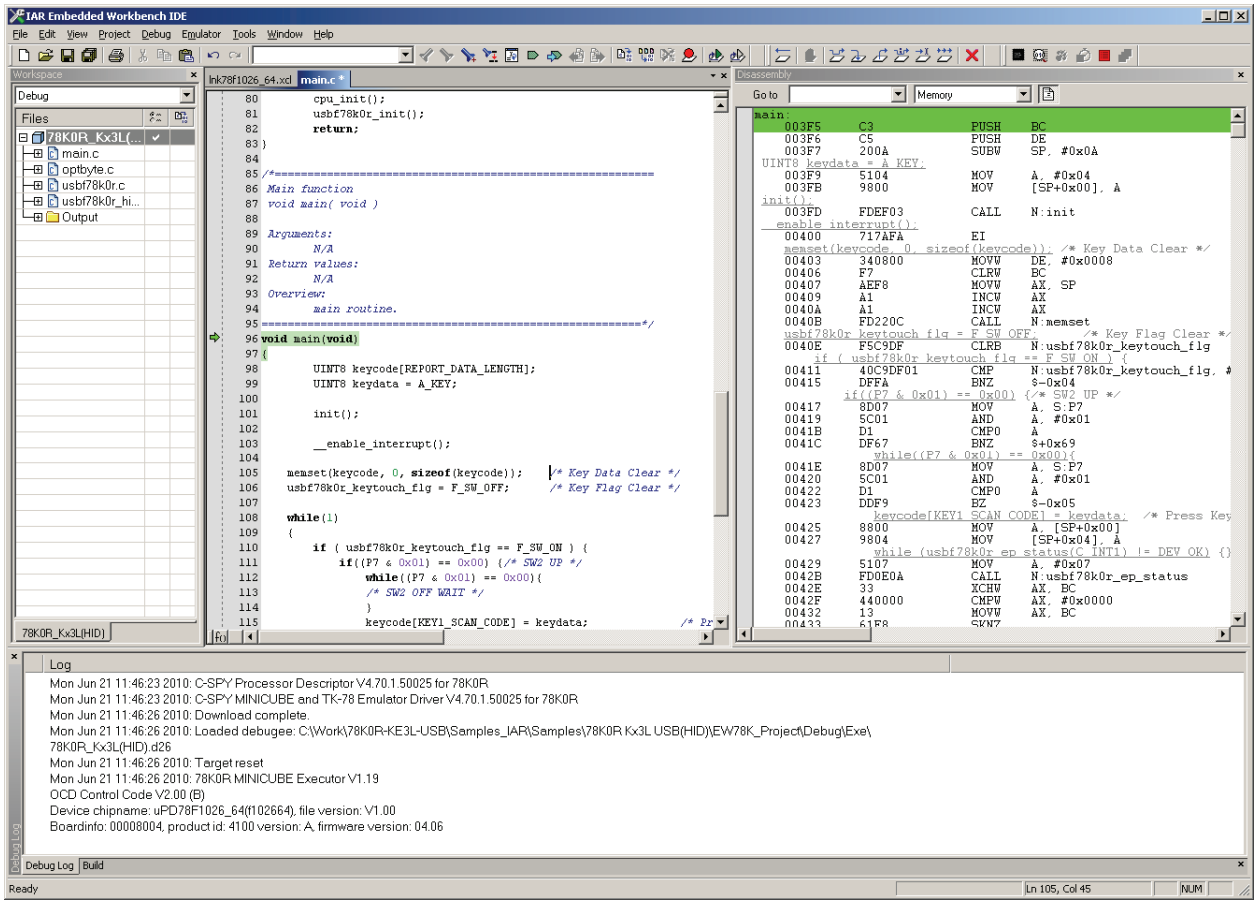

IAR Embedded Workbench IDE
Log
Mon Jun 21 11:46:23 2010: C-SPY Processor Descriptor V4.70.1.50025 for 78K0R
Mon Jun 21 11:46:23 2010: C-SPY MINICUBE and TK-78 Emulator Driver V4.70.1.50025 for 78K0R
Mon Jun 21 11:46:26 2010: Download complete.
Mon Jun 21 11:46:26 2010: Loaded debugee: C:\Work\78K0R-KE3L-USB\Samples_IAR\Samples\78K0R Kx3L USB(HID)\EW78K_Project\Debug\Exe\78K0R_Kx3L(HID).d26
Mon Jun 21 11:46:26 2010: Target reset
Mon Jun 21 11:46:26 2010: 78K0R MINICUBE Executor V1.19
OCD Control Code V2.00 (B)
Device chipname: uPD78F1026_64(f102664), file version: V1.00
Boardinfo: 00008004, product id: 4100 version: A, firmware version: 04.06

Figure 20 C-Spy Debug Session

After the download the application, is started automatically and stopped at the beginning of the main function. To disable the automatic start and run to main, please unmark this feature in the debugger options setting (see Figure 16).

3.8 Run Application Program

To run the application program either press the ‘Go’ toolbar button, select the menu ‘Debug->Go’ or use the keyboard and press ‘F5’

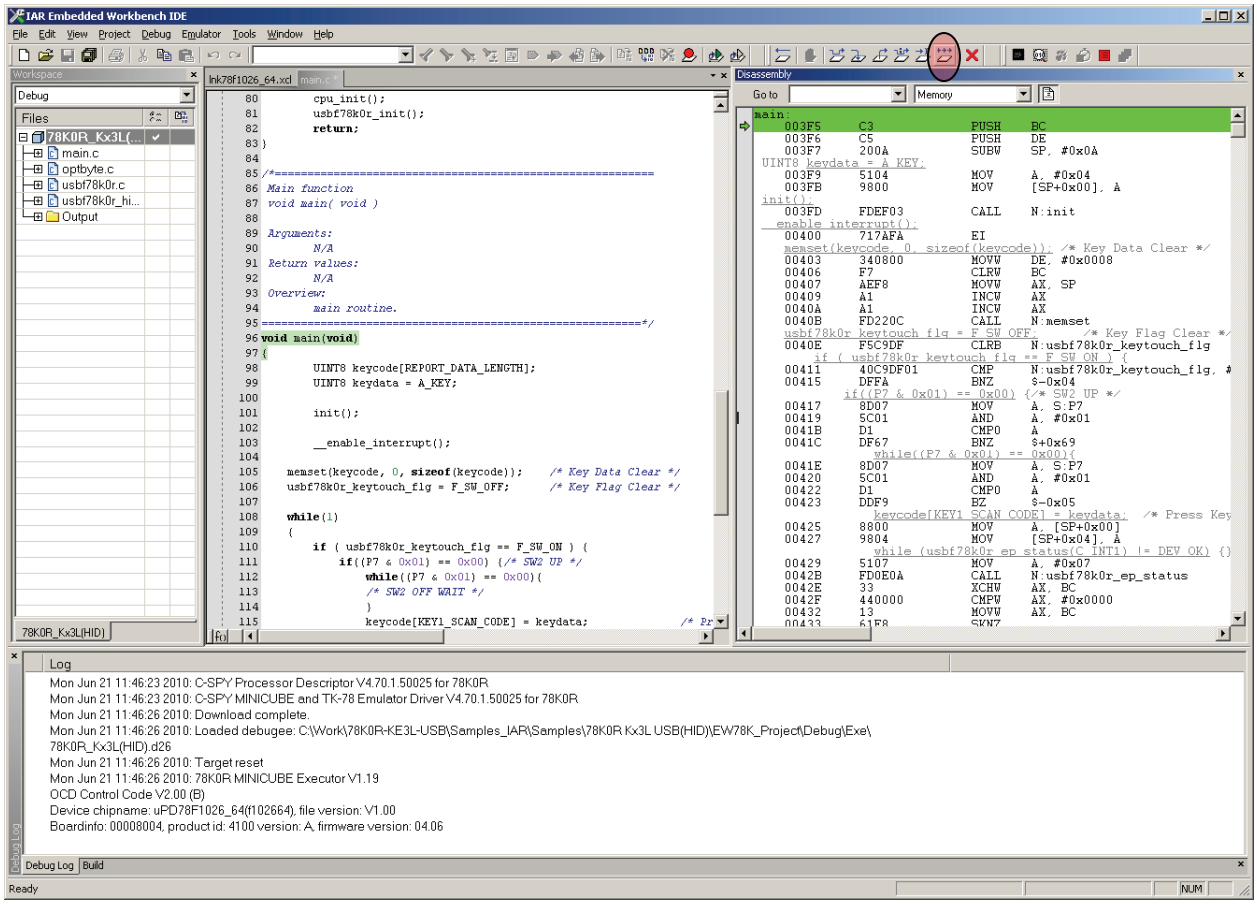


Figure 21 C-Spy 'Go' Button

When the application is running, the ‘Go’ button and all single step buttons are disabled:

Figure 22 C-Spy Application Control Buttons Run Mode

Figure 23 C-Spy Application Control Buttons Stop Mode

Connect the PC to USB1 on TK-78K0R/KE3L+USB with USB cable while the application is running.

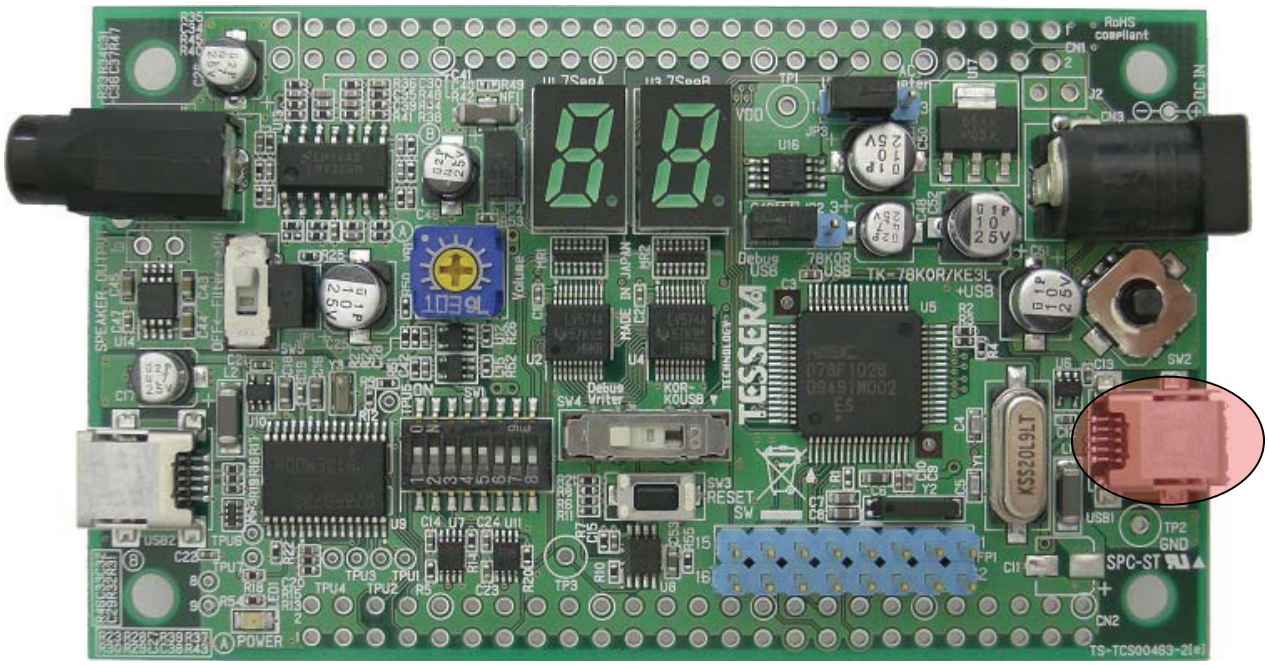


Figure 24 TK-78K0RKE3L+USB USB connector USB1

Start the Windows Notepad editor or any other text editor of your choice.

The alphabet is entered by "SW2" operation to the up side; pushing "SW2" starts the new paragraph as follows.

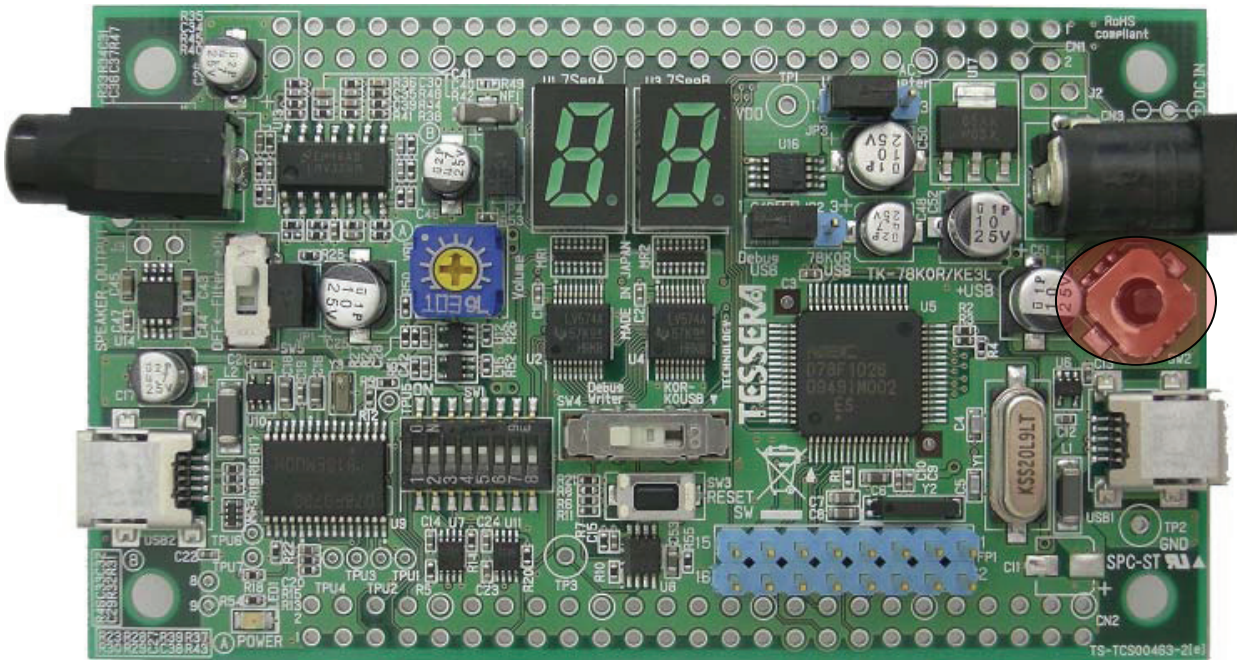


Figure 25 TK-78K0RKE3L+USB switch SW2

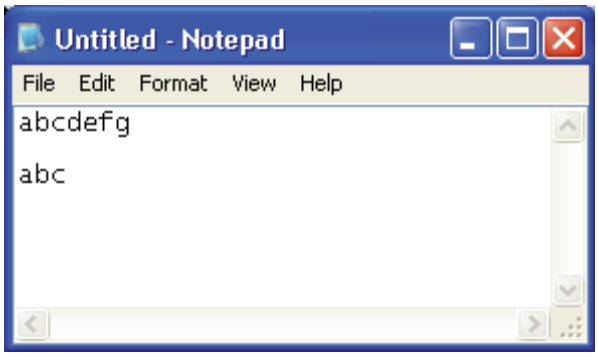


Figure 26 Notepad Editor

Entering characters similar to Figure 25 confirms that the application is working correctly.

For more information about the functions that are used in those sample program, see "USB HID (Human Interface Device) Class Driver application note".

3.9 Stop Application Program

To stop the application program either press the ‘Break’ toolbar button or select the menu ‘Debug->Break’.

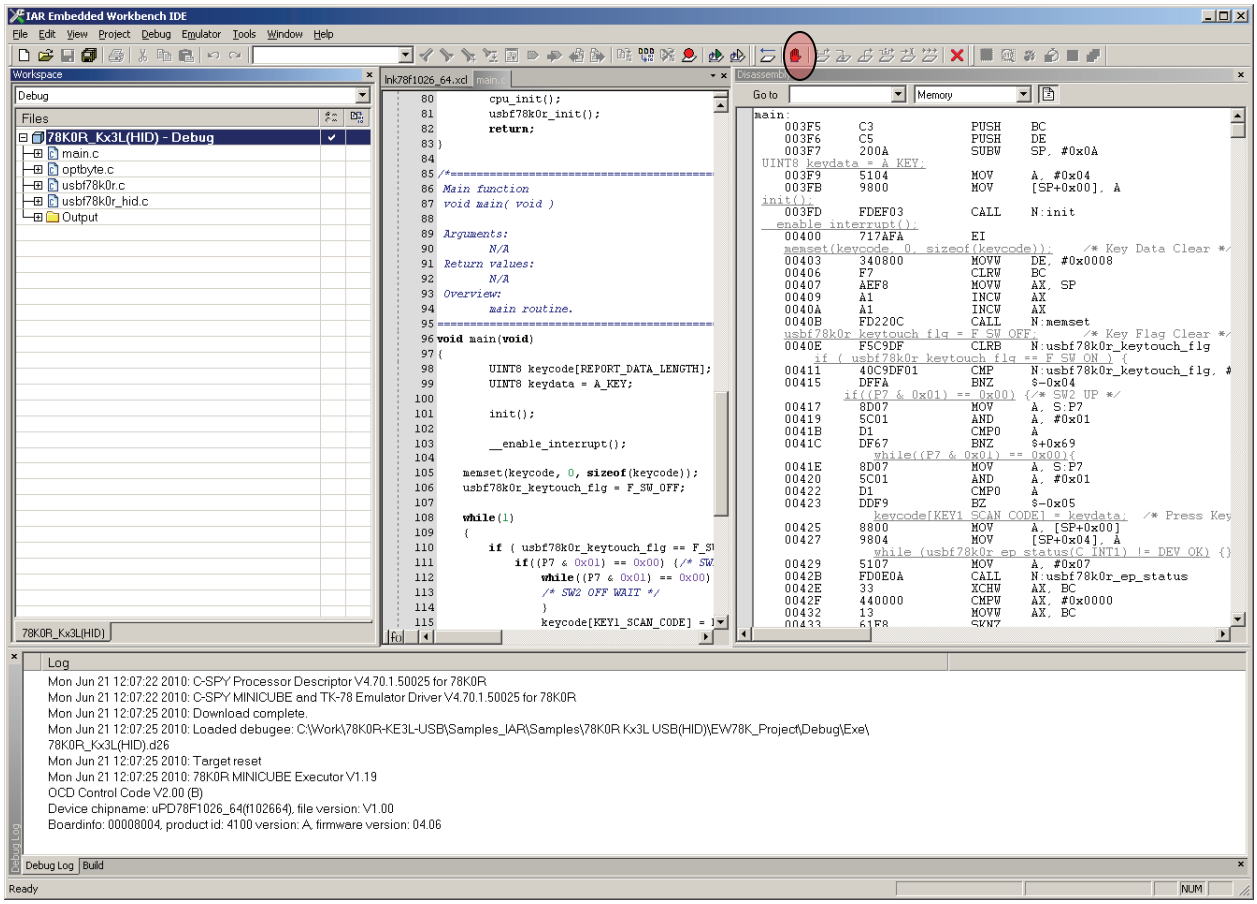

IAR Embedded Workbench IDE
Workspace
Debug
Files
78K0R_Kx3L(HID) - Debug
main.c
optbyte.c
usbf78k0r.c
usbf78k0r_hid.c
Output
Log
Mon Jun 21 12:07:22 2010: C-SPY Processor Descriptor V4.70.1.50025 for 78K0R
Mon Jun 21 12:07:22 2010: C-SPY MINICUBE and TK-78 Emulator Driver V4.70.1.50025 for 78K0R
Mon Jun 21 12:07:25 2010: Download complete.
Mon Jun 21 12:07:25 2010: Loaded debugee: C:\Work\78K0R-KE3L-USB\Samples_IAR\Samples\78K0R Kx3L USB(HID)\EW78K_Project\Debug\Exe\78K0R_Kx3L(HID).d26
Mon Jun 21 12:07:25 2010: Target reset
Mon Jun 21 12:07:25 2010: 78K0R MINICUBE Executor V1.19
OCD Control Code V2.00 (B)
Device chipname: uPD78F1026_64(1102664), file version: V1.00
Boardinfo: 00008004, product id: 4100 version: A, firmware version: 04.06
Debug Log
Build
Ready

Figure 27 C-Spy 'Break' Button

3.10 Close C-Spy Debug Session

To close a debug-session please press the ‘Stop Debugging’ toolbar button.

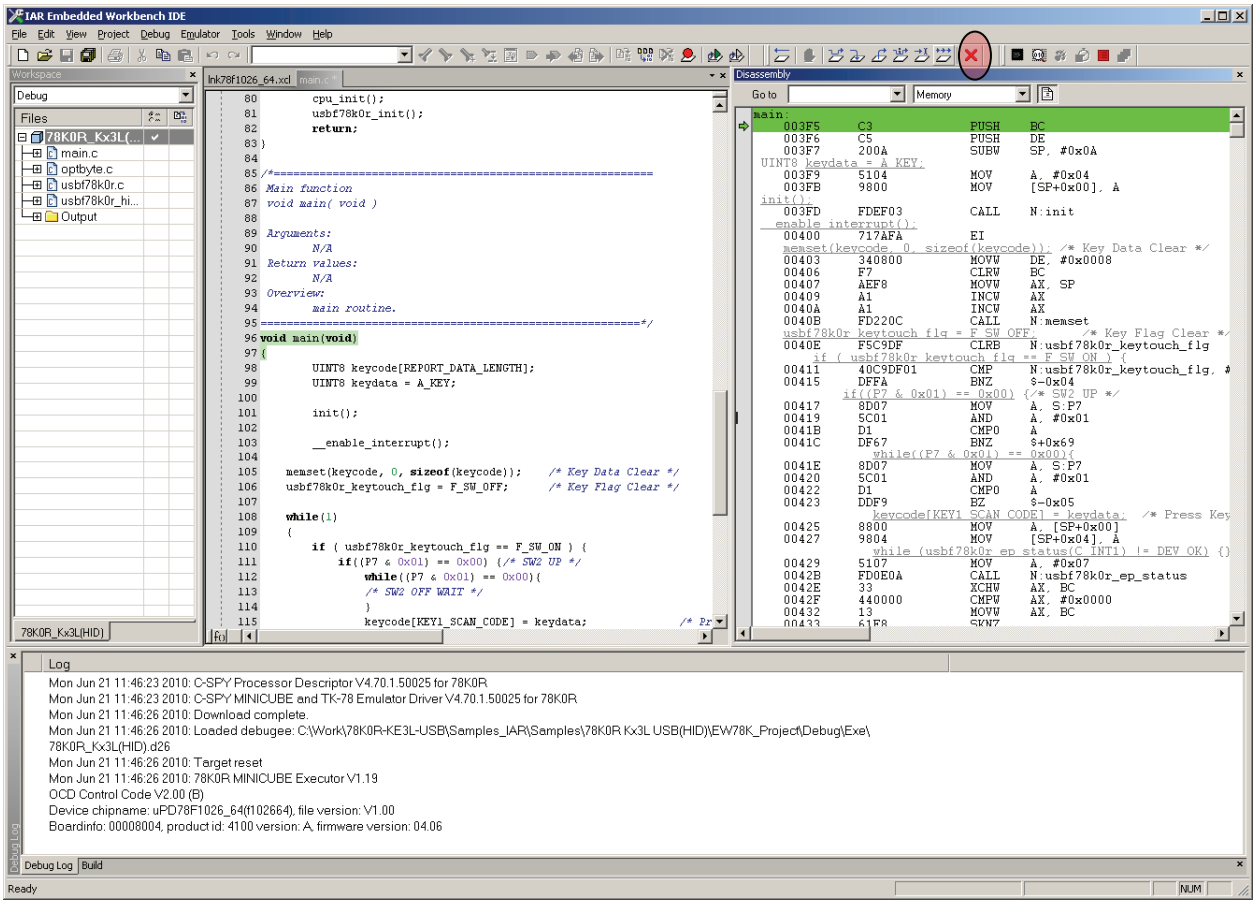


Figure 28 C-Spy 'Stop Debugging' Button

After closing the debug session, the Embedded Workbench is back in ‘Edit Mode’

3.11 Close Embedded Workbench

To close the Embedded Workbench please use the menu ‘File -> Exit’.

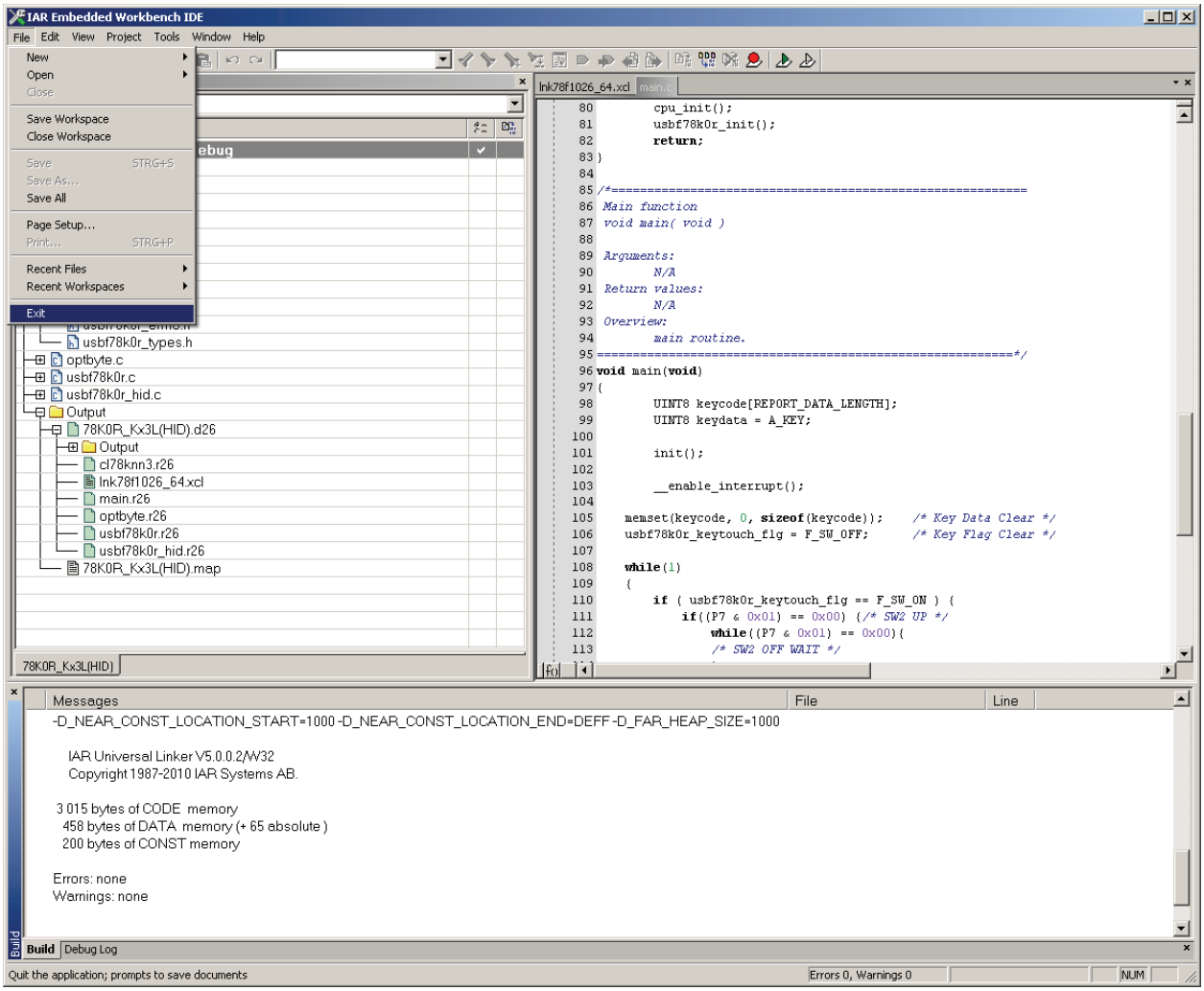


Figure 29: IAR Embedded Workbench Close

Chapter 4 Hardware Specification

In this chapter, the hardware of TK-78K0R/KE3L+USB will be explained.

Microcontroller	µPD78F1026 (78K0R/KE3-L)
Clock	External main system clock: 20MHz Subsystem clock: 32.768KHz Internal oscillation clock: 20, 8, 1MHz
Audio	PWM output Filter:LMV324M:NS(U13) AMP:LM4865M:NS(U14) Speaker:0.3W (for simplified monitoring) Jack:3.5mm monaural Filter ON/OFF Switchable (SW5) Output Volume (VR1)
Interface	USB MINI B (USB1) USB Function USB MINI B (USB2) Debug/Serial communication Expansion connector 50Pin socket x2 pad only(CN1,CN2) Connecter for MINICUBE2 (FP1)
Power Supply Voltage	5V (USB or AC adapter)
Input/output for operation check use The name in brackets is the name printed on the board	·4 ways + center-push switch (SW2) ·Dip switch (SW1) ·7Seg-LED (U1,U2) ·Reset switch (SW3)

Table 4 TK-78K0RKE3L+USB Hardware Overview

4.1 Layout of hardware functions

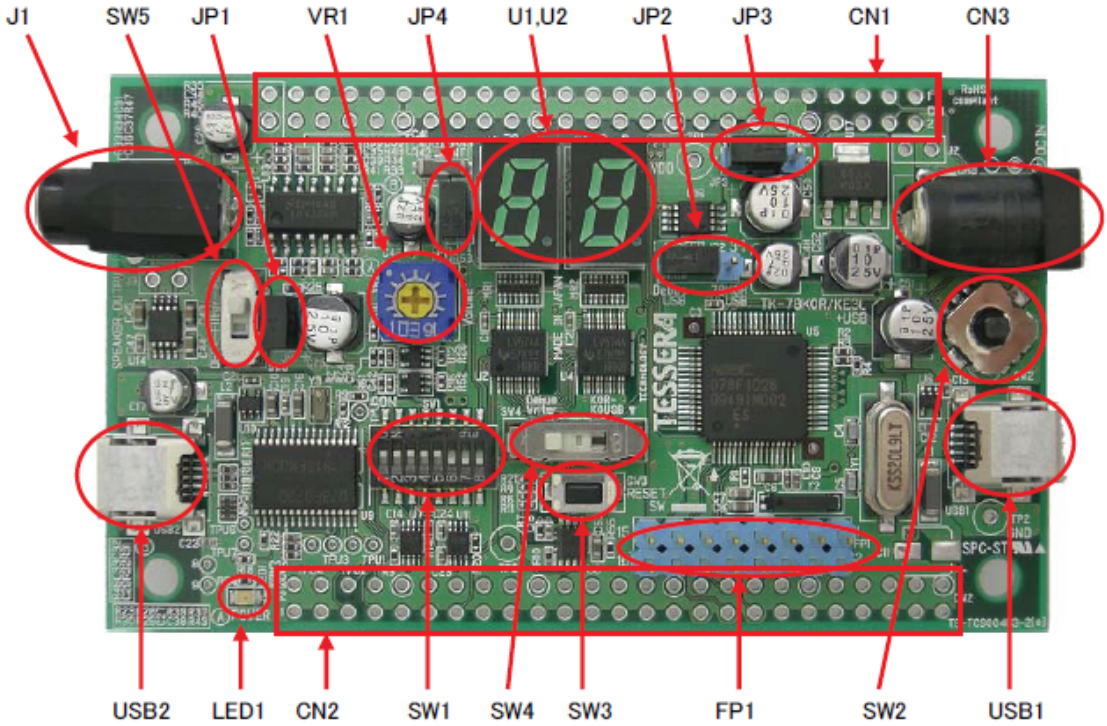


Figure 30 Troubleshooting

4.2 Layout of solder-short pad and test pad

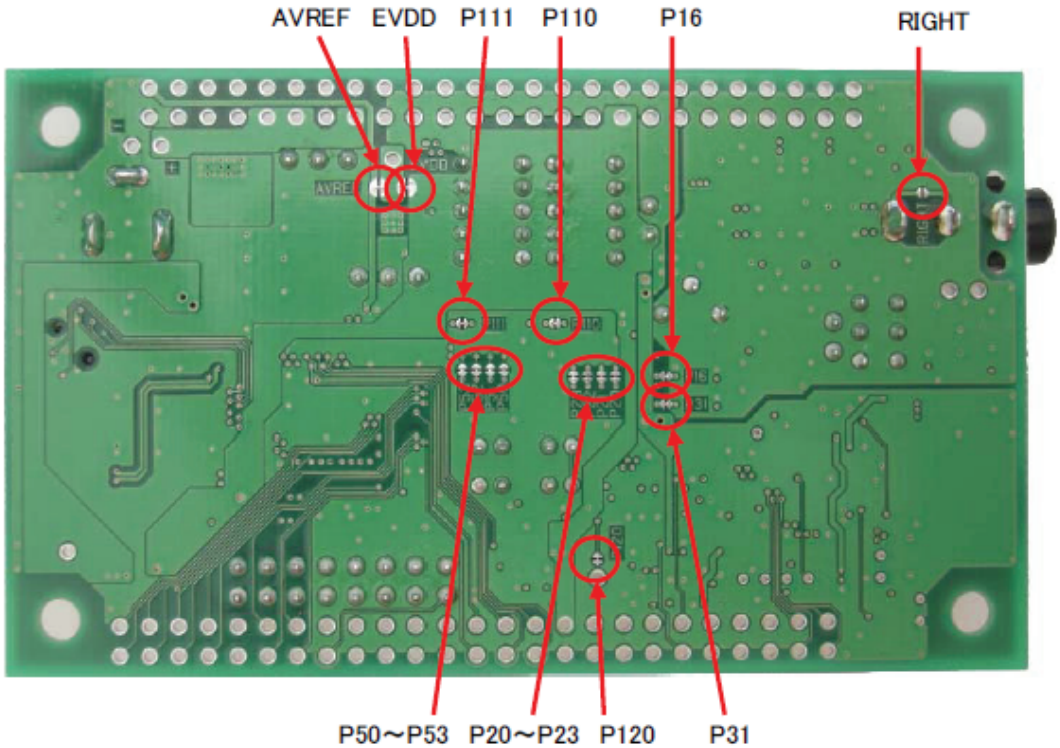


Figure 31 TK-78K0RKE3L+USB pads

4.3 Hardware Functions

4.3.1 SW1, SW4

The bit 1-3 on SW1 are for debug mode settings, bit 4,5 are for mode settings and bit 6-8 are DIP switches connected to P41,P42,P17 pins in microcontroller.

1) In case of using the C-Spy debugger use following settings:

SW1								SW4
1	2	3	4	5	6	7	8	
ON / OFF	ON	ON	X	X	X	X	X	Debug/Writer Side

Table 5 C-Spy Debug Configuration

SW1:1

ON: The microcontroller runs the programs stored in the flash memory as soon as it gets power supply.
OFF: The microcontroller stays being reset until C-Spy started.

2) In case of running the programs stored in built-in flash memory without using C-Spy debugger or debugging the microcontroller with MINICUBE2, use following settings and re-supply power.

SW1								SW4
1	2	3	4	5	6	7	8	
OFF	OFF	OFF	ON	X	X	X	X	K0R-K0R USB Side or center

Table 6 Standalone Configuration

Set switch SW4 in position ‘center’, if you use P11 and P12 on the Expansion connector

3) Bit4 is the switch for POWER LED.

   ON: If CPU is supplied power, LED1 is turned on.

   OFF: If CPU is supplied power, LED1 isn't turned on.

4) Bit5 is the switch for the audio mute.

   ON: Audio output is muted by P31output low.

   OFF: Non audio mute

5) The bits 6-8 are connected to P41, P42, P17 pins of the microcontroller. ON means "Low" and OFF means "Open". When you need to use this, you need to set the microcontroller built-in pull-up resistor option registers (PU1, PU4) to ON. For details about settings of microcontroller built-in pull-up resistor option registers, refer to 78K0R/KE3-L User's Manual (U19878E).

SW1		
6	7	8
P42	P43	P17

Table 7 SW1 Bit 6-8

4.3.2 SW2 (INTP0)

SW2 is a 4 ways + center-push switch. When the switch is moved to one of 4 ways or is pushed down, it sends the signal of "Low". When it is released, it becomes "Open" again. You need to set the pull-up resistor option register ON for this function. (For more information about the pull-up resistor option register, refer to the 78K0R/KE3-L user's manual, U19878E).

SW2	Signal Name	MCU Pin Name	Operation
1pin	P70	P70 / KR0	UP
2pin	P71	P71 / KR1	CENTER PUSH
3pin	P72	P72 / KR2	LEFT
4pin	P74	P74 / KR4 / INTP8	RIGHT
5pin	GND	GND	
6pin	P73	P73 / KR3	DOWN

Table 8 SW2 Pin Functions (ALPS SKRHADE010)

4.3.3 SW3 (RESET SW)

This is the reset switch. You can reset the microcontroller by pressing this switch.

4.3.4 SW5 (Filter)

SW5 is the slide switch to select use/not use of the Filter (LMV324M). When it sets to "OFF", it does not use the Filter and it inputs sound signals from microcontroller to AMP.

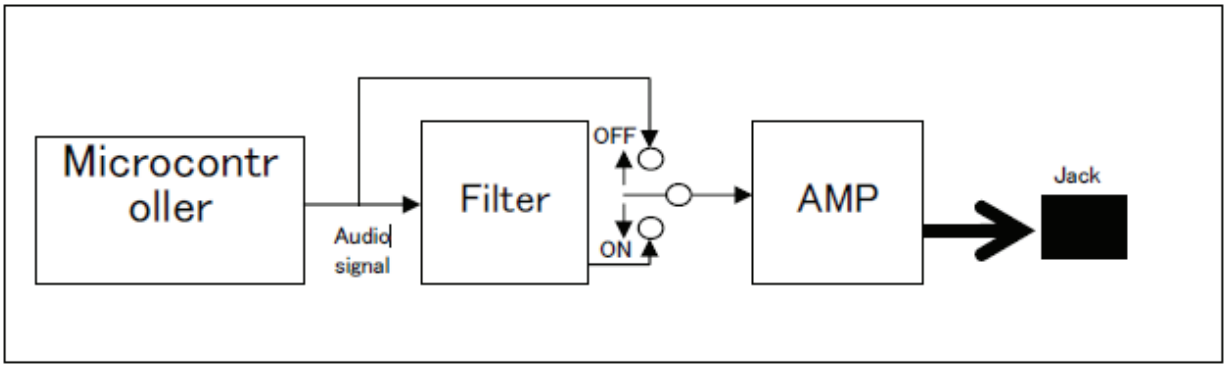


Figure 32 SW5 Filter Setting

4.3.5 JP1

JP1 is the jumper switch pin for connecting the microcontroller and the filter.

Please set the jumper switch pin short circuit. Please refer to the circuit diagram for further details.

4.3.6 JP2, JP3

JP2, JP3 are jumper switch pin for selecting the power supply to the CPU.

JP2	JP3	
1-2 short	1-2 short	USB power supply from USB2 connecter
2-3 short	2-3 short	USB power supply from USB1 connecter
-	2-3 short	AC adapter power supply from CN3 connecter.

Table 9: Power Supply Configuration

4.3.7 JP4

JP4 is the jumper switch pin for supplying the power to the audio circuit.

Please set the jumper switch pin short circuit. Please refer to the circuit diagram for further details.

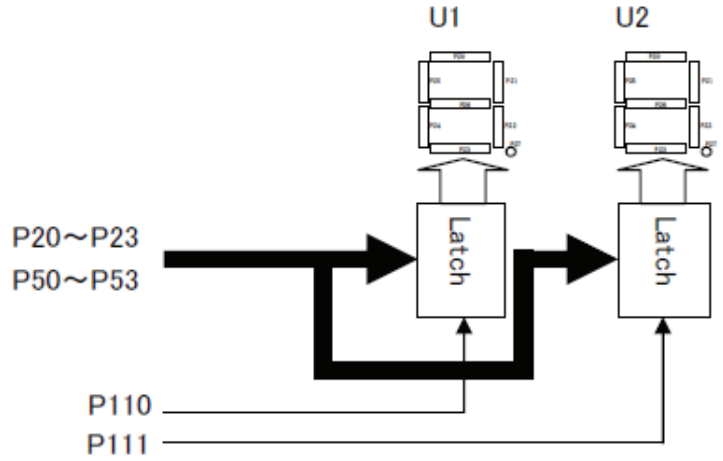
4.3.8 LED1 (POWER)

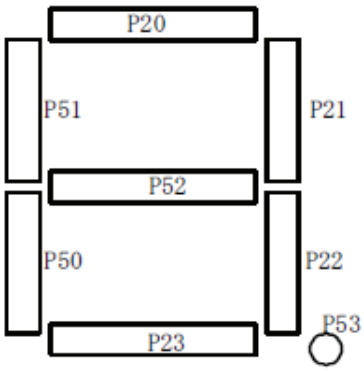
This is the POWER LED. It is lighted when it gets power supply.

You can turn off the LED by setting the bit4 OFF on SW1.

4.3.9 U1, U2 (7-segment LED)

U1and U2 are 7-segment LED. By setting the 7-segment LED output data in P20-P23 and setting P50-P53 from Low to High, the data is latched and the 7-segment LED displays the data.





Example of data and its display

0	0xC0	5	0x92
1	0xF9	6	0x83
2	0xA4	7	0xf8
3	0xB0	8	0x80
4	0x99	9	0x98

Figure 33 7-Segment LEDs

To display "1" on U1 and "2" on U2:

```
P11_bit.no1 = 0;
P11_bit.no1 = 1;     // Set P111 to Low, then High
P2 = 0xa4;
P5 = 0xa4>>4;        // Set data for "2" in P2 and P5
P11_bit.no0 = 0;
P11_bit.no0 = 1;     // Set P110 to Low, then High
P2 = 0xf9;
P5 = 0xf9>>4;        // Set data for "1" in P2 and P5
PM11_bit.no0 = 0;
PM11_bit.no1 = 0;    // Set P110, 111 to output mode
PM5 = 0xf0;          // Set lower 4bit of P5 to output mode
PM2 = 0xf0;          // Set ower 4bit of P2 to output
```

4.3.10 CN1, CN2

These are the connecters for expansion connections.

The connecter is not installed. (HIROSE ELECTRIC CO., LTD. HIF-3H-50DA-2.54DSA).

4.3.11 CN3

This is the connector for AC adapter. Please, connect the bundled AC adapter (+5V).

Support plug: 2.1mm DC jack (center plus).

4.3.12 J1

This is the jack for external speakers. Connect a speaker when you play sound.

Support jack: 3.5mm (monaural).

4.3.13 VR1

This is the audio output volume control. If the audio mute is set, then audio is not output.

4.3.14 USB1

This is the USB connecter for the USB function controller.

4.3.15 USB2

This is the USB connecter for the debug / serial communication.

It is found as “NEC Electronics Starter Kit Virtual UART”.

4.3.16 FP1

This is the interface for connecting MINICUBE2.

4.3.17 Solder-short pad label

With using the solder-short pad to cut the circuit, users can customize the circuit. The solder-short pad looks like the picture below. To open, use cutter to cut the dent part. To short, put solder on the pad.

Solder-short pad (Open)

Solder-short (Short)

Solder-short pad name	Before shipment	Connection	
P120	short	short	P120 connected to USB1 bus power detecting signal
		open	P120 used as multipurpose I/O
P16	short	short	P16 is connected to audio circuit.
		open	P16 used as multipurpose IO.
P31	short	short	P31 is connected to audio muting circuit.
		open	P31 used as multipurpose IO.
AVREF	short	short	VDD = AVREF
		open	AVREF is separated from VDD
EVDD	short	short	VDD = EVDD
		open	EVDD is separated from VDD
P110, P111	short	short	P110 and P111 are connected to 7-Segment LED data latch circuit.
		open	P110 and P111 used as multipurpose I/O
P20~P23, P50~P53	short	short	These ports are connected to 7-Segment LED data latch circuit.
		open	These ports used for multipurpose IO
RIGHT	open	short	External speaker output connecter J1 is connected as stereo connecter.
		open	Connection for the monaural connecter

Table 10 Solder Short Pad Description

Note: All ground signals are connected.

Chapter 5 Troubleshooting

5.1 If you cannot find USB driver when connecting the kit

Check Point 1 If you use USB hub, do not use it. (USB hub is not supported)

Check Point 2 Check if you installed "Starter Kit USB Driver" in "2.3 USB Driver Installation ". If not, install the driver.

Check Point 3 If above two check points are confirmed, disconnect the USB cable from PC and re-connect again. It should show the "Found New Hardware Wizard" wizard. Operate the installation with referring to "2.3 USB Driver Installation". After the installation, make sure you go through "2.3.3 Completion of USB Driver Installation" to confirm the USB driver installation

5.2 Error when you start the debugger

There could be several reasons to make errors happen.

The solving processes differ depending on errors. Please check the error message first.

5.2.1 "Can not communicate with Emulator..." (F0100 or A0109)

Check Point 1 If you use USB hub, do not use it. (USB hub is not supported)

Check Point 2 Check if the settings of switches on the kit are correct with referring "3.6 Check Board Setting".

Check Point 3 Confirm the USB driver installation with referring to "2.3.3 Completion of USB Driver Installation".

Check Point 4 If above three check points are confirmed, close the debugger and disconnect the USB cable from PC. Re-connect USB cable properly to both the PC and the kit, and then re-start the debugger.

5.2.2 "Incorrect ID Code." (Ff603)

This error occurs when the security ID stored on microcontroller built-in flash memory is different from the ID code you entered at the start of debugger.

Figure 34 Security ID entry area at the start of debugger

Check Point 1 Enter correct security ID and click OK on the configuration window.

Check Point 2 If you forgot the security ID, you have to erase the microcontroller built-in flash memory. Before erasing, check if you actually set the security ID in your application. Also remember the code you set for the security ID. After this, erase the flash memory with referring to "5.4 Erase microcontroller built-in flash memory".

5.2.3 "On-chip debug function had been disabled in the device." (F0c79)

This error occurs when the value at address 00C3H (On-chip debug option byte) in microcontroller built-in flash memory is incorrect. You need to erase the flash memory.

Check Point 1 Check if you actually set the correct on-chip debug option byte in your application. If it is not correct, then set correctly.

Check Point 2 Erase the flash memory with referring to "5.4 Erase microcontroller built-in flash memory"

Chapter 6 Other Information

This chapter explains some useful operation techniques of development tools and circuit diagram of the kit for developing of user programs.

6.1 Create a new Workspace

Now, create a new workspace and project.

The Embedded Workbench allows you to create a new workspace with following "New Workspace" dialog.

Select "File -> New Workspace...":

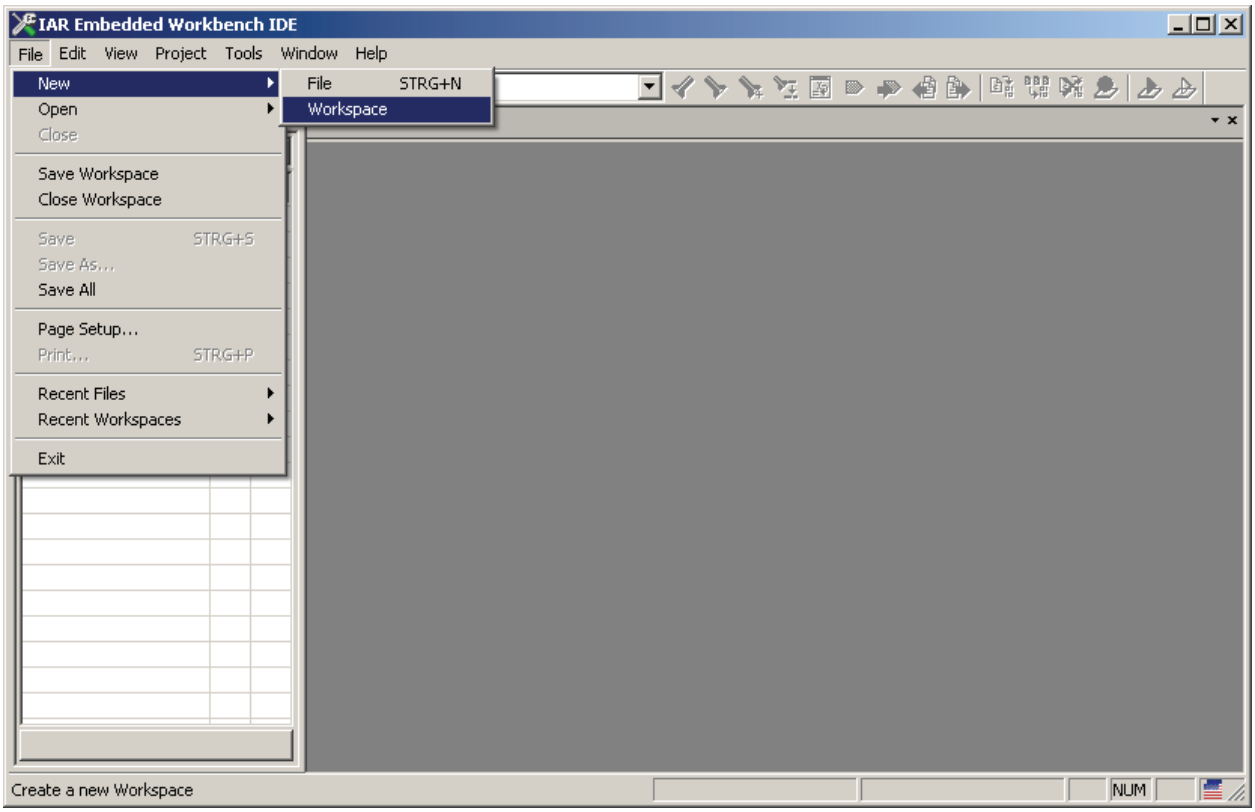


Figure 35 EW78K Create new Workspace

6.2 Add one or multiple Projects to a new Workspace

After creating a new workspace you can one or multiple existing projects or create a new project

Select "Project -> Add existing Project...":

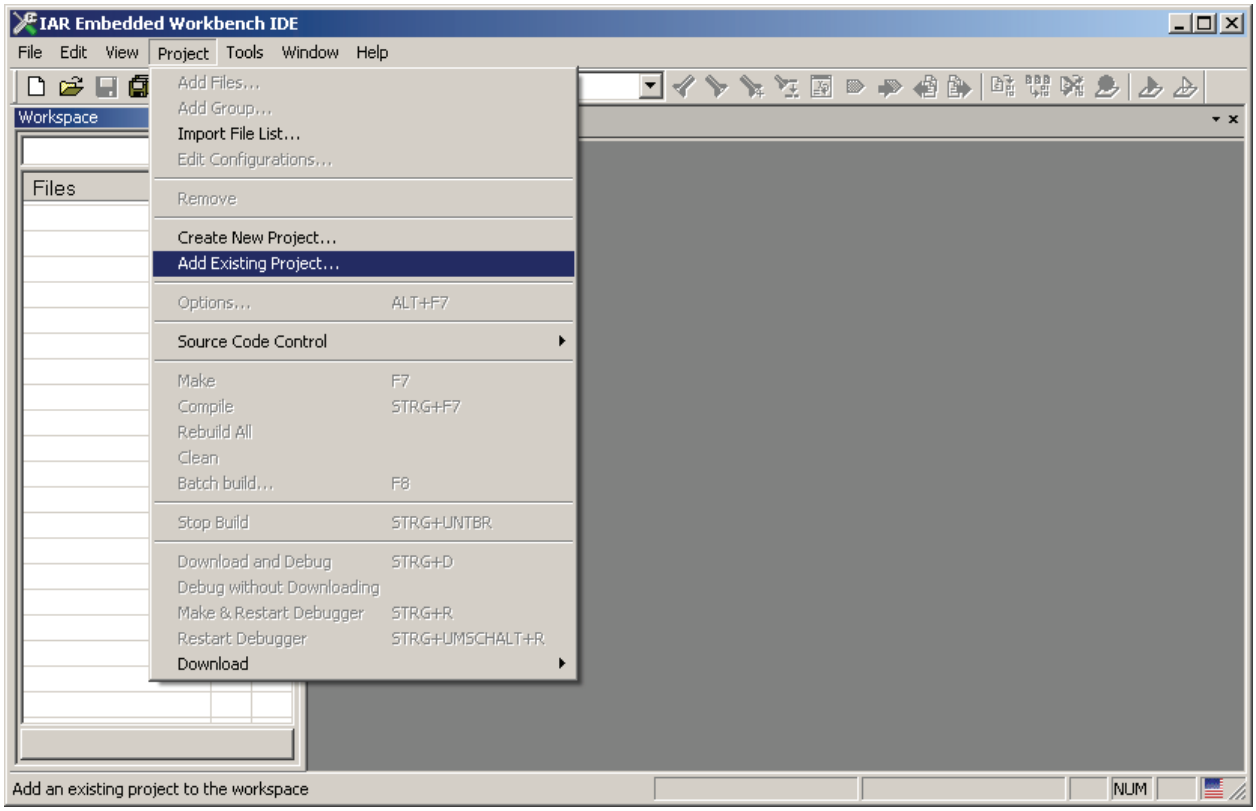


Figure 36 EW78K Add existing Project

Select the project-file (*.ewp) of the project you want to add:

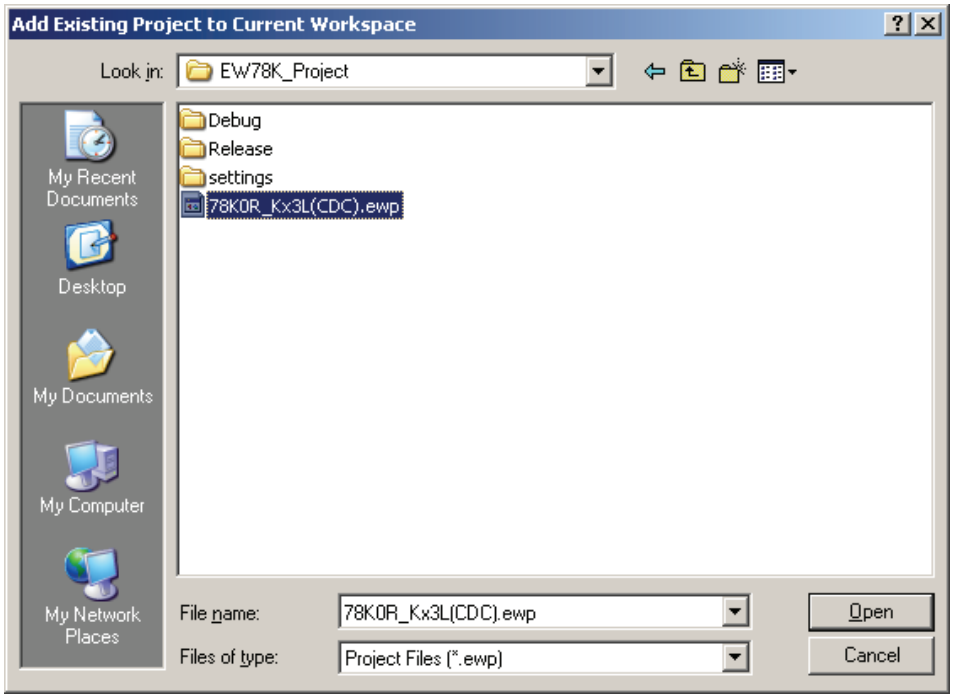


Figure 37 EW78K Add Existing Project Dialogue

Alternatively you can create a new project by selecting ‘Project->Create New Project…’

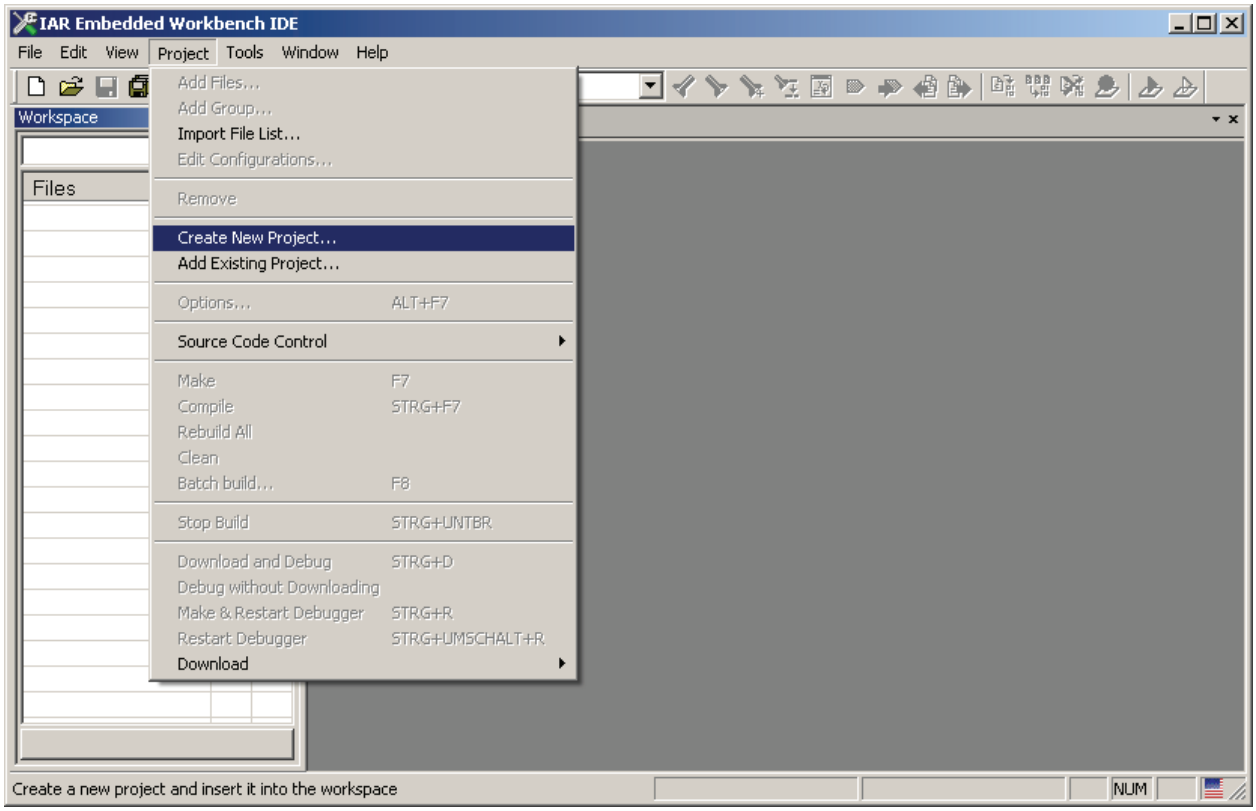


Figure 38 Create New Project

In following dialogue you can select a template used for the new project. If you want to create a new project from scratch manually, please ‘Empty Project’

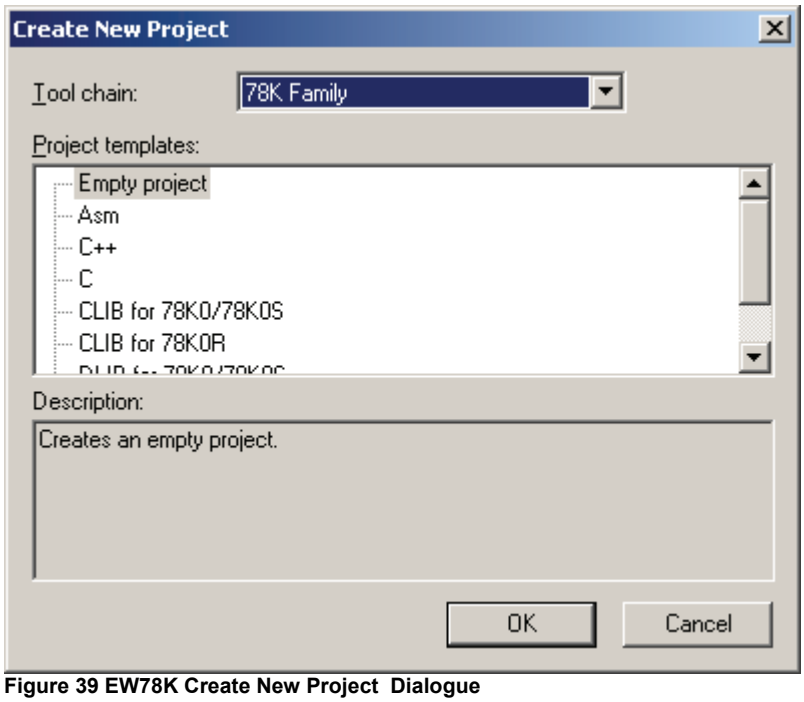


Figure 39 EW78K Create New Project Dialogue

After adding an existing project or creating a new project you have an titled Workspace which has to be saved by ‘File All”:

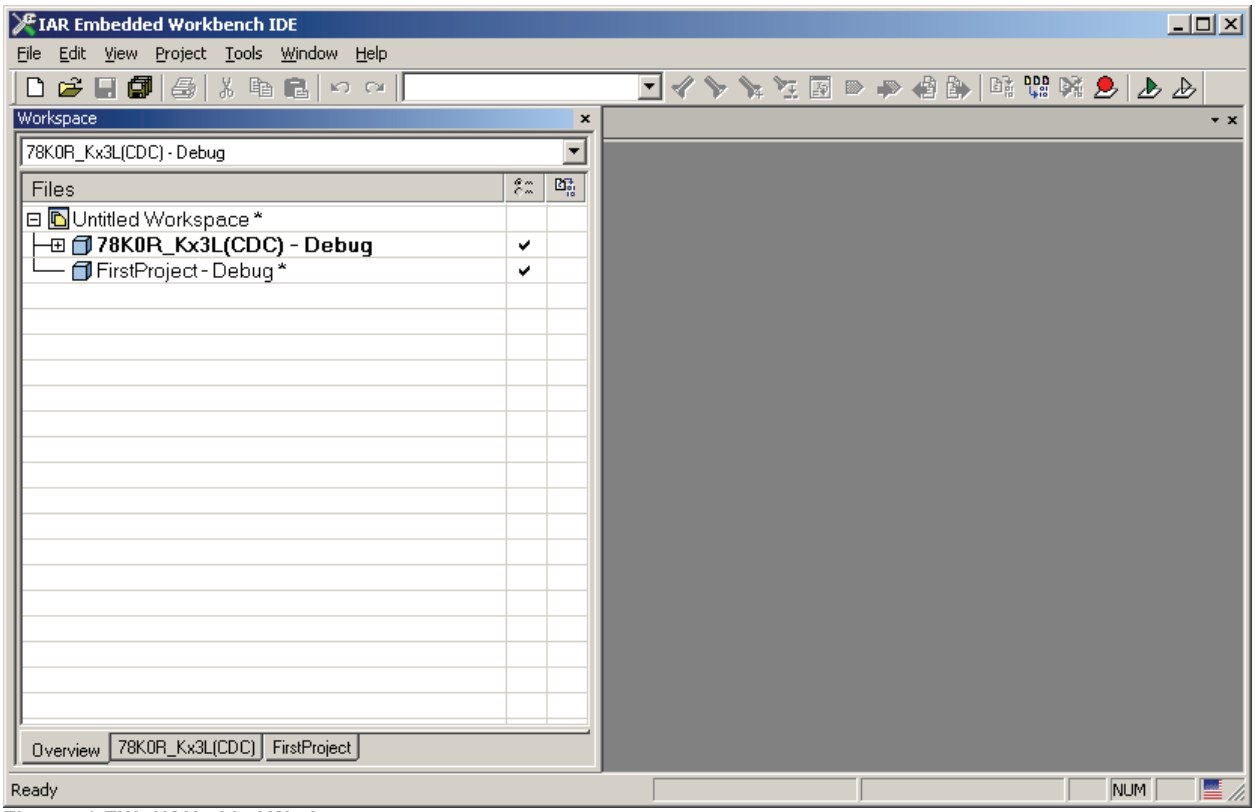


Figure 40 EW78K Untitled Workspace

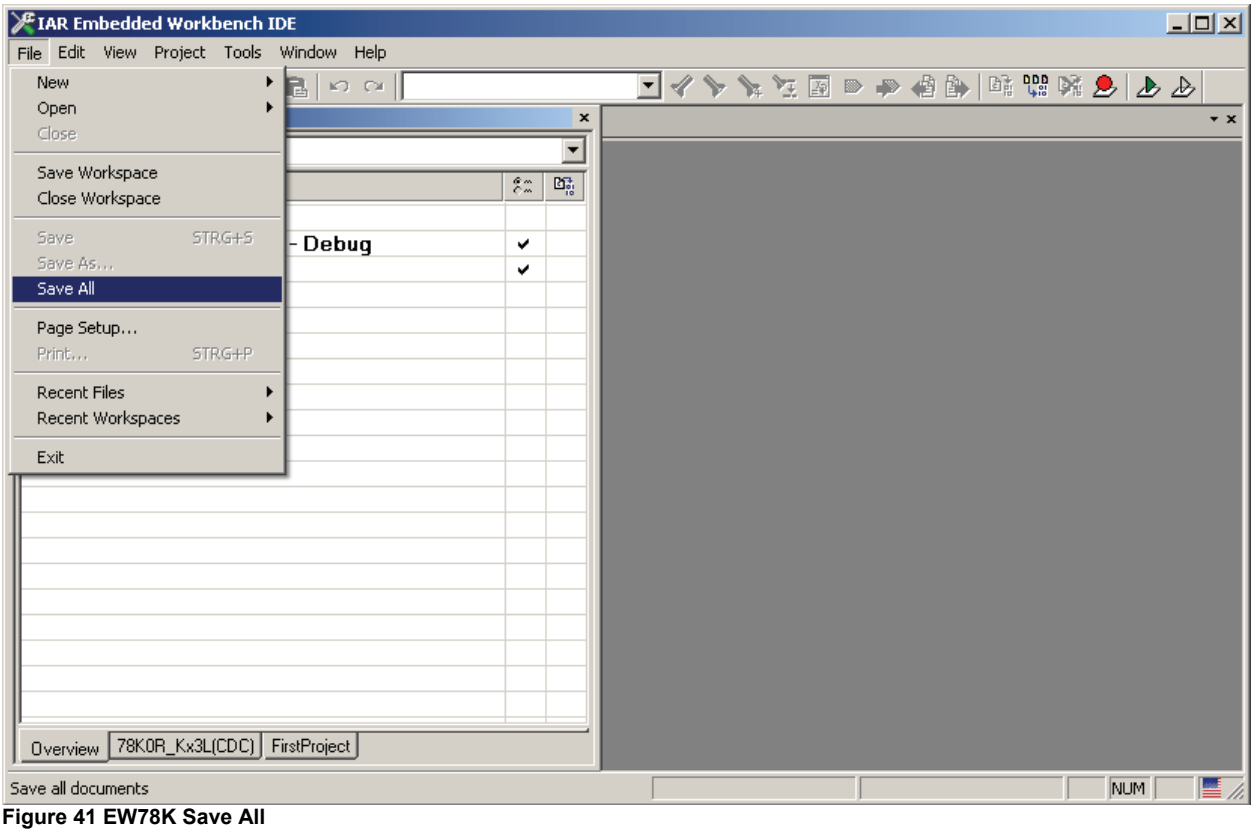


Figure 41 EW78K Save All

In the following Dialogue you can specify the workspace name and the location where it shall be stored:

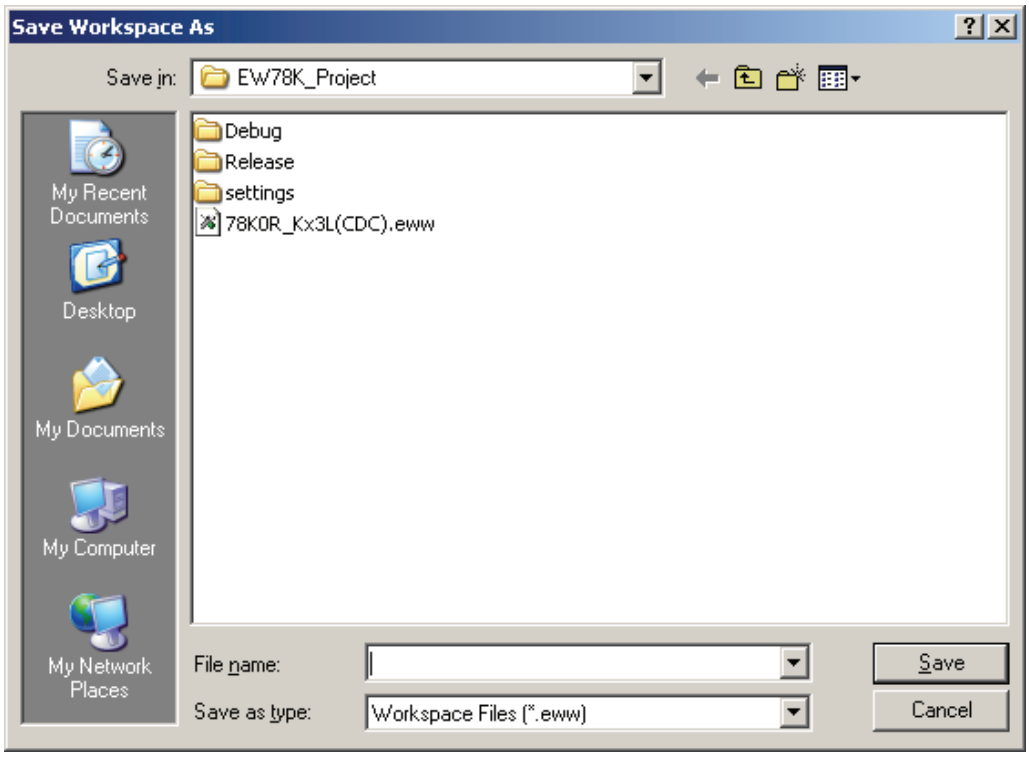


Figure 42 EW78K Save Workspace As Dialogue

6.3 Add additional Source Files to a Project

To add an additional source file to an existing project, please select ‘Project -> Add Files…’.

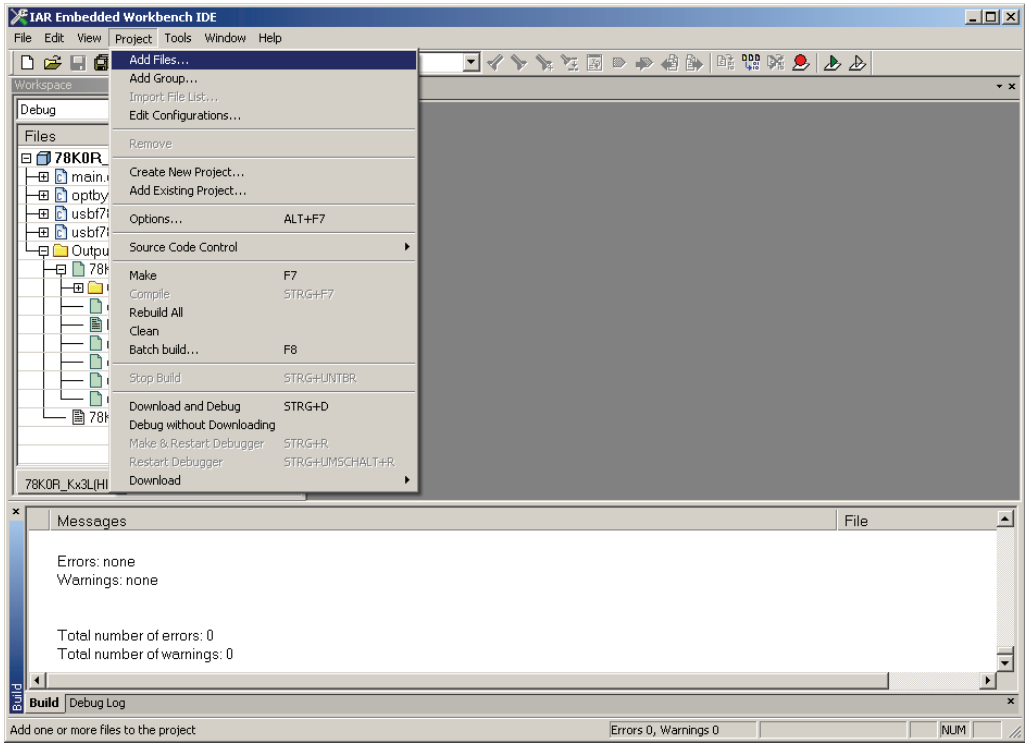


Figure 43 EW78K Add Files

In the following dialogue you can specify the source file to be added. Please keep mind that only files listed according to the selected extension filter:

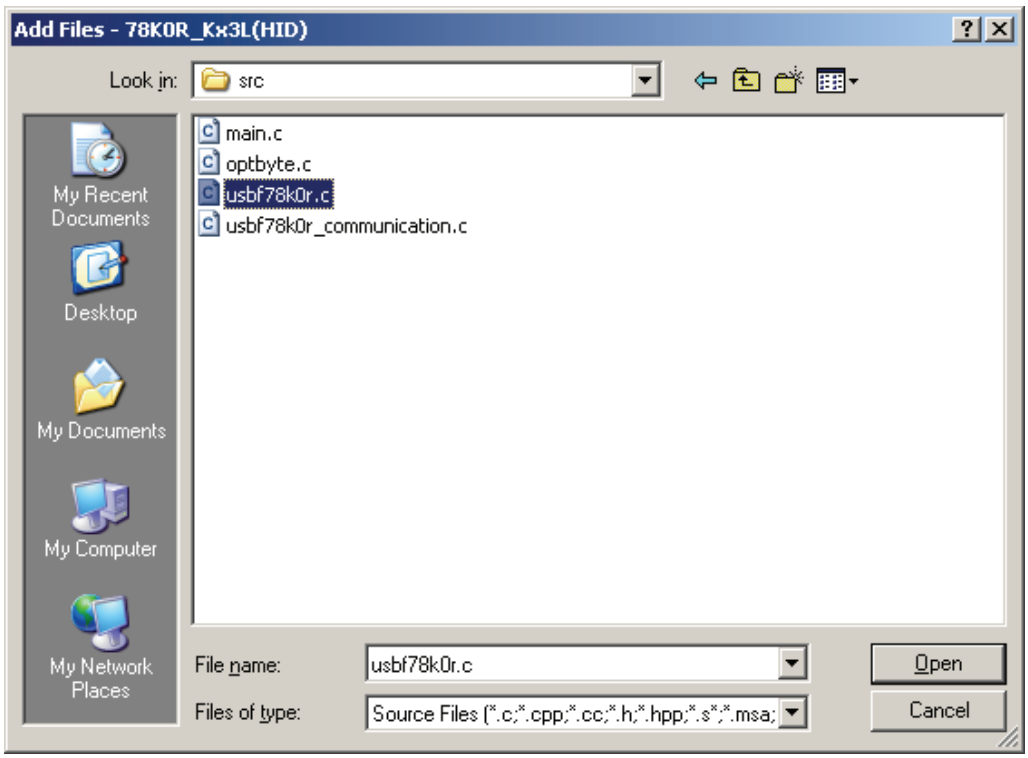


Figure 44 EW78K Add Files Dialogue

6.4 Debugger Tips

6.4.1 Set/delete breakpoints

A breakpoint at a specific source line can be defined either by

- moving the cursor to the source code line and pressing the key ‘F9’

or

- moving the cursor to the source code line, open the pop-menu by right mouse button click and selecting “Toggle Breakpoint (CODE)”.

or

- using the Breakpoint Definition Dialogue

An active breakpoint is marked by a filled red circle in the first row

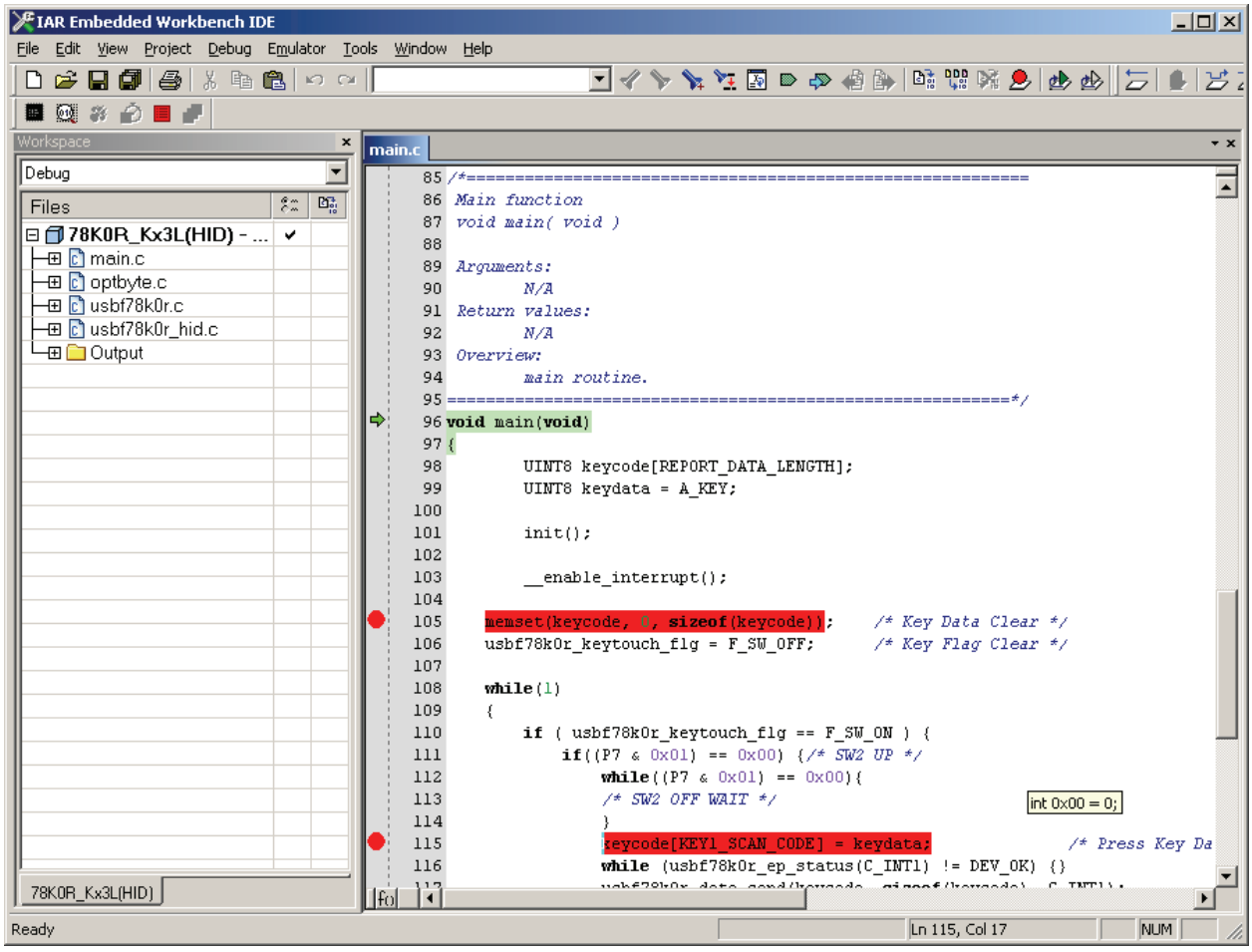


Figure 45 C-Spy active Breakpoint

You get an overview about all defined breakpoints by selecting “View -> Breakpoints”

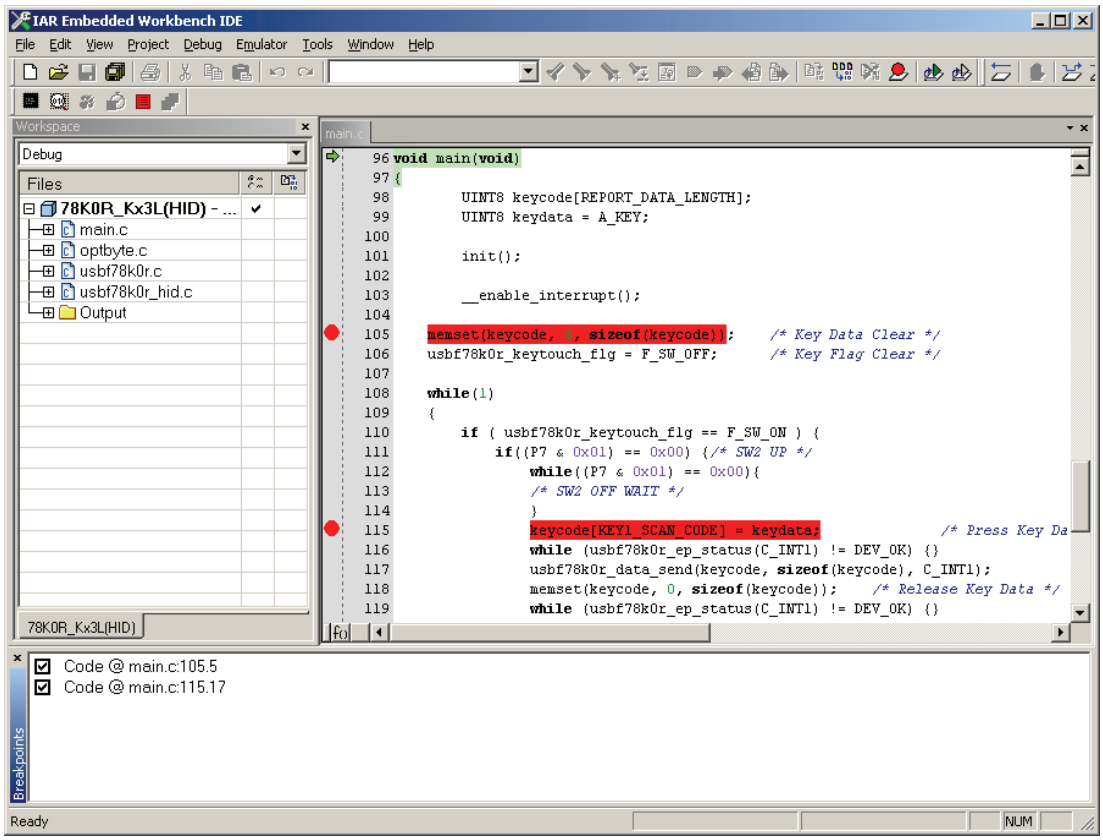


Figure 46 C-Spy Breakpoint Window

Breakpoints can be delected or deactivated in Pop-up menu of the Breakpoint Window. A deactivated breakpoint is marked as a non-filled red circle in the source code window.

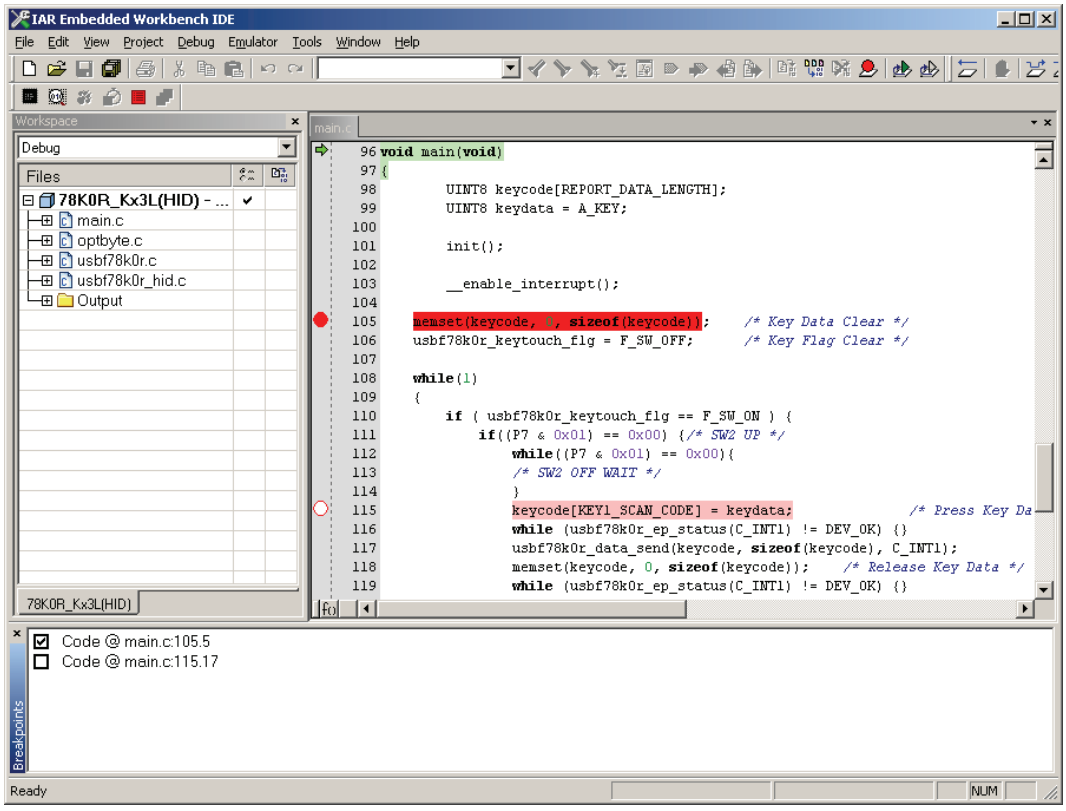


Figure 47 C-Spy deactivated Breakpoint

6.4.2 Display global Variables

Global variables are displayed in the Watch Window (select menu “View-> Watch”). Variables can be added either by entering the variable name manually, or by selecting the variable and using the Pop-up menu ‘Add to watch” or by simple “drag & drop” the symbol name from Source Code Window to Watch Window.

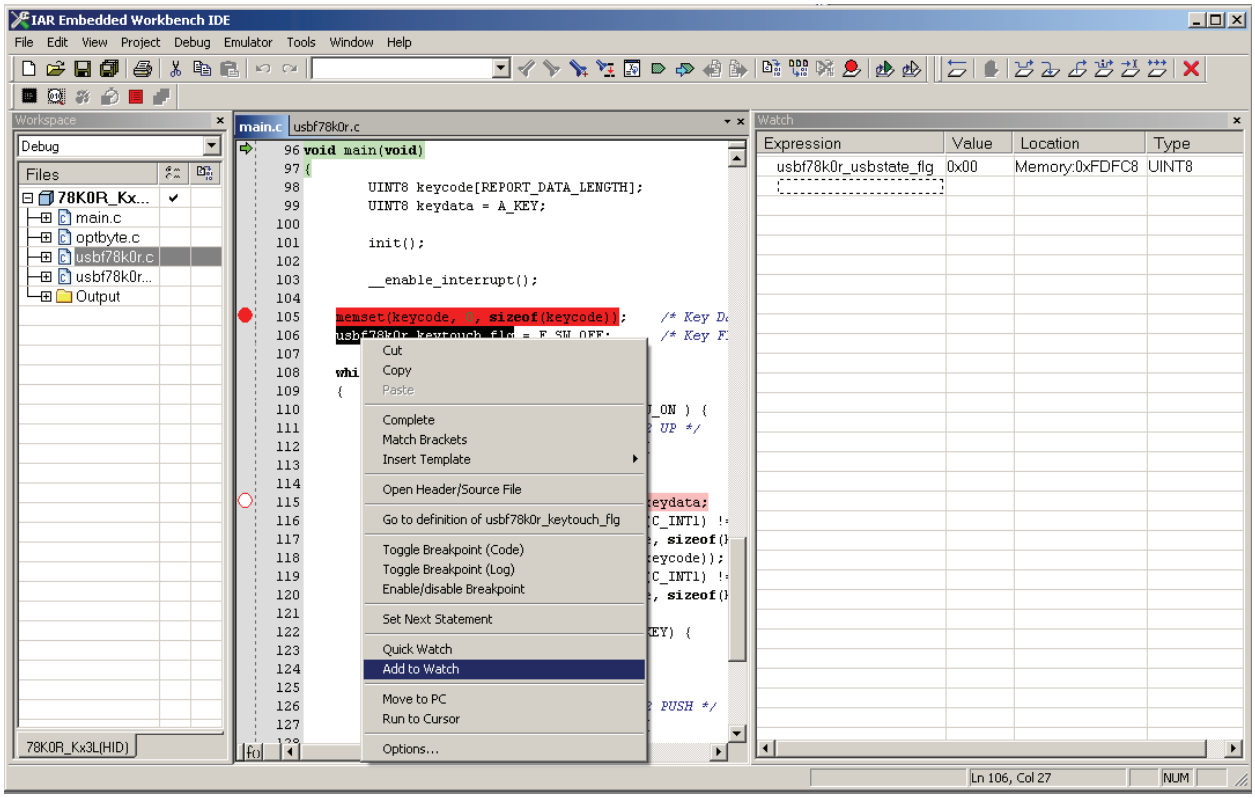


Figure 48 C-Spy display global Variables

6.4.3 Display global Variables while Application is running

The C-Spy Watch Window is not updated while the application is running. To display global variables while the application is running please use the Live-Watch Window (select menu “View -> Live Watch”).

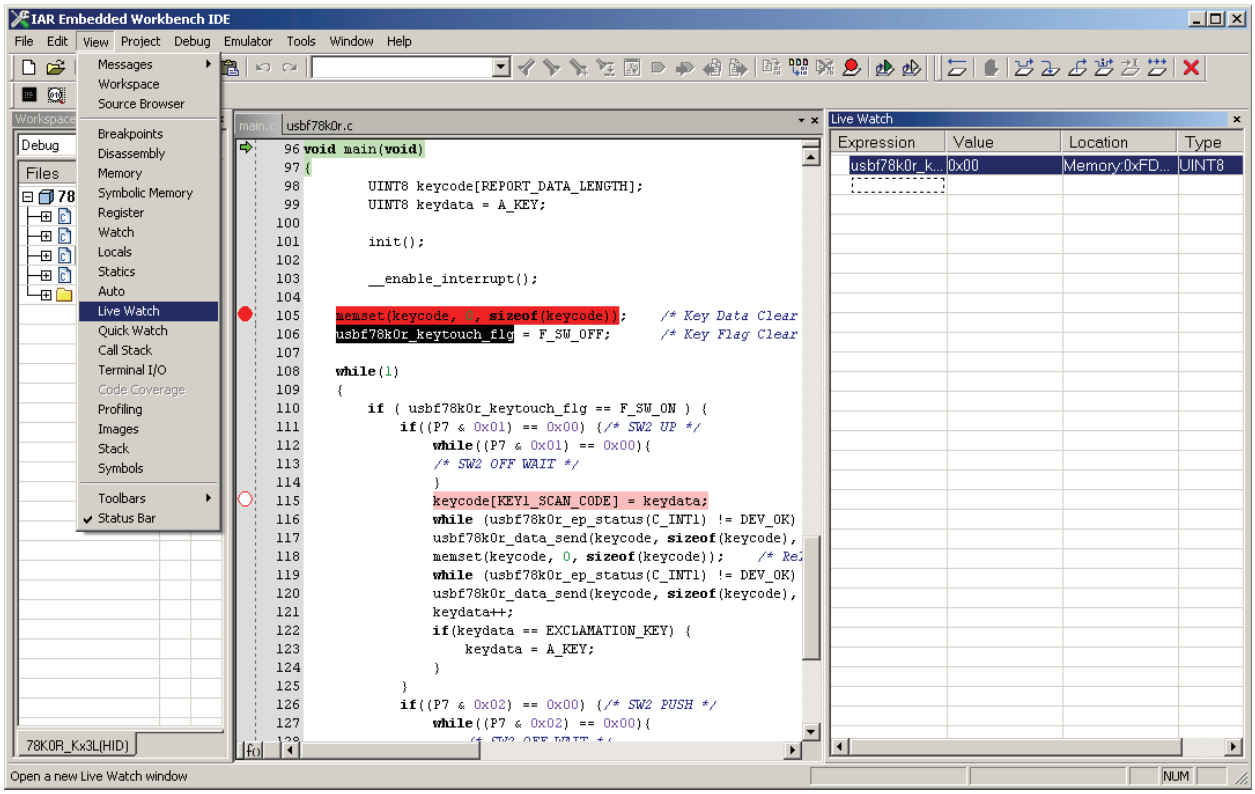


Figure 49 C-Spy display global Variables while Application is running

6.4.4 Display local Variables

Local Variables are displayed automatically in the Local Watch Window (select menu ‘View -> Locals”).

The variable list can not be modified manually, but is an automatically generated list according the currently executed function.

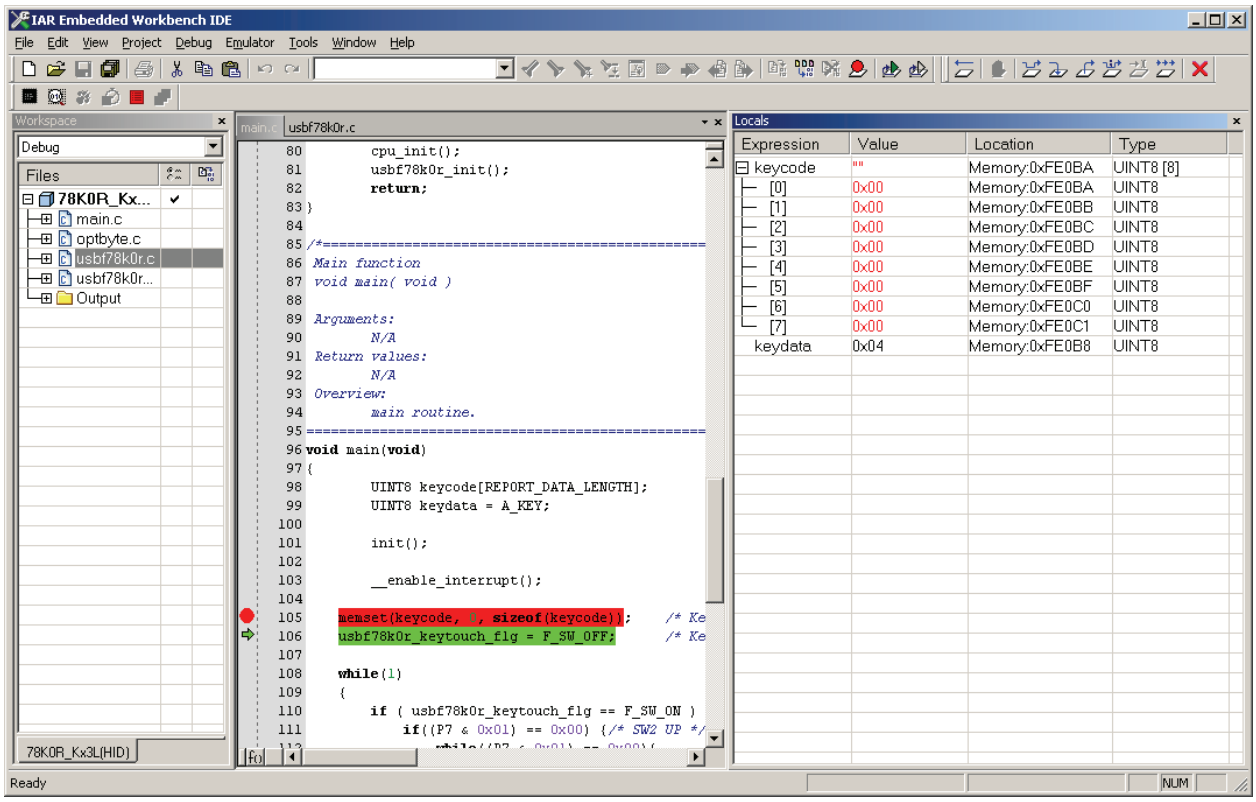


Figure 50 C-Spy display local Variables

6.4.5 Display Memory Content

The complete memory area (Flash and RAM area) is displayed in the memory window (select menu ‘View -> Memory). Changed values since the last break are marked in red.

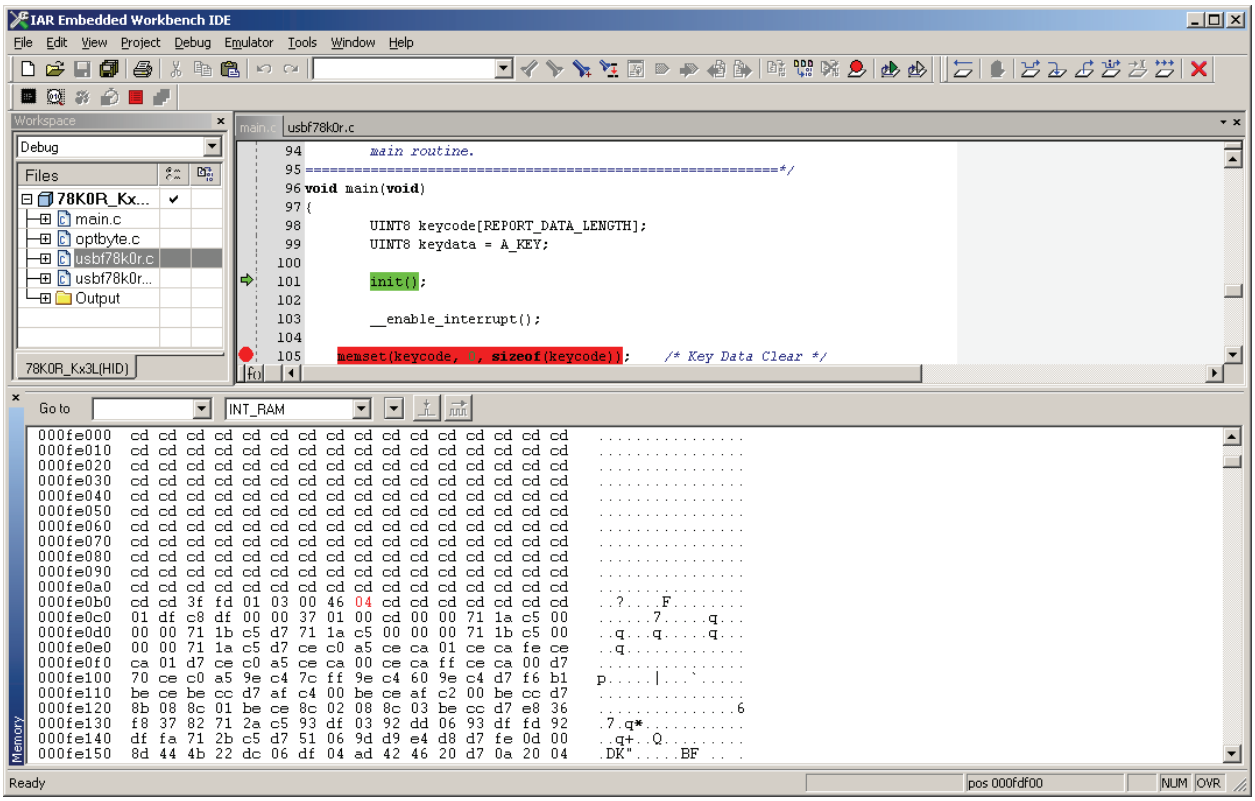


Figure 51 C-Spy display of Memory Content

6.4.6 Display Memory Content while Application is running

Like the Watch Window the Memory Window is also only updated when the application is stopped. To display the memory content while the application is running the Live Memory Window has to be used (select Emulator -> Live Memory). Instead of the compete memory only up to 16 byte can be displayed.

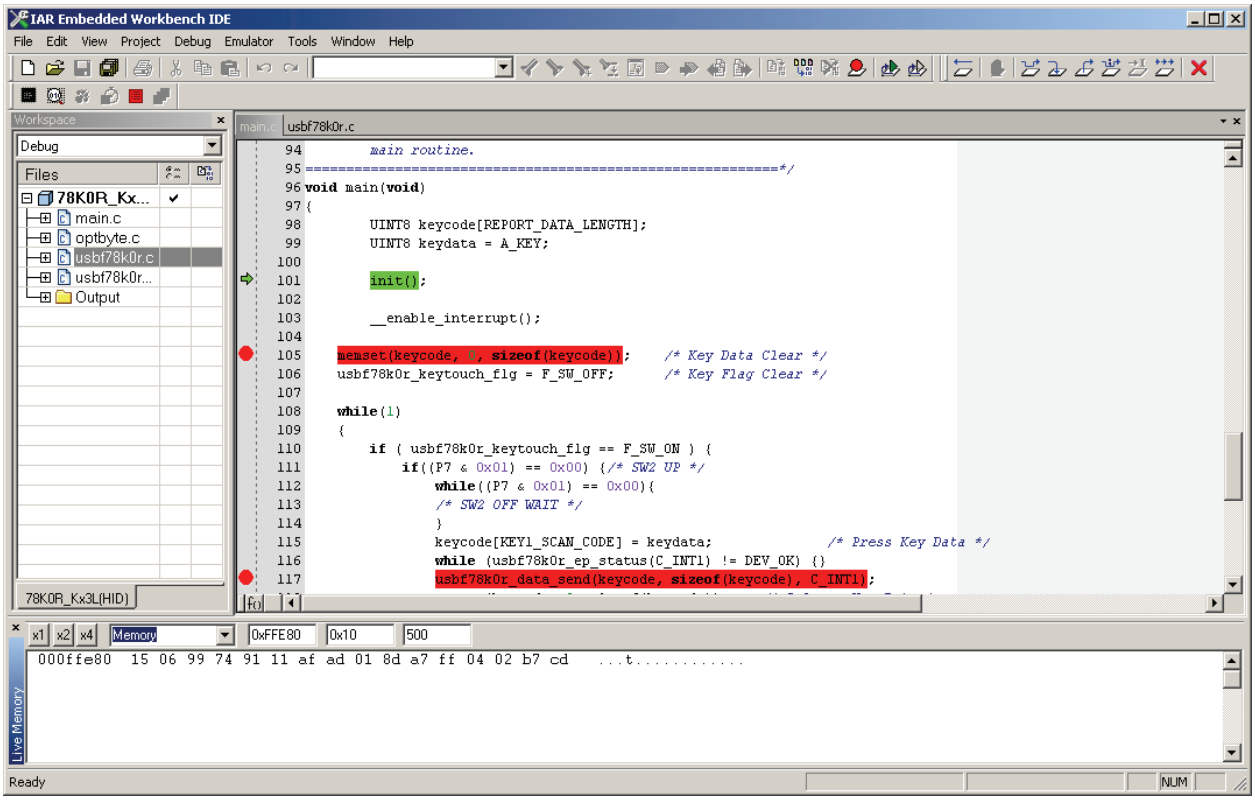


Figure 52 C-Spy Display of Memory Content while Application is running

6.4.7 Display of CPU- and I/O-Register Content

The content of CPU- and I/O registers is displayed in the Register Window (select “View -> Register”).

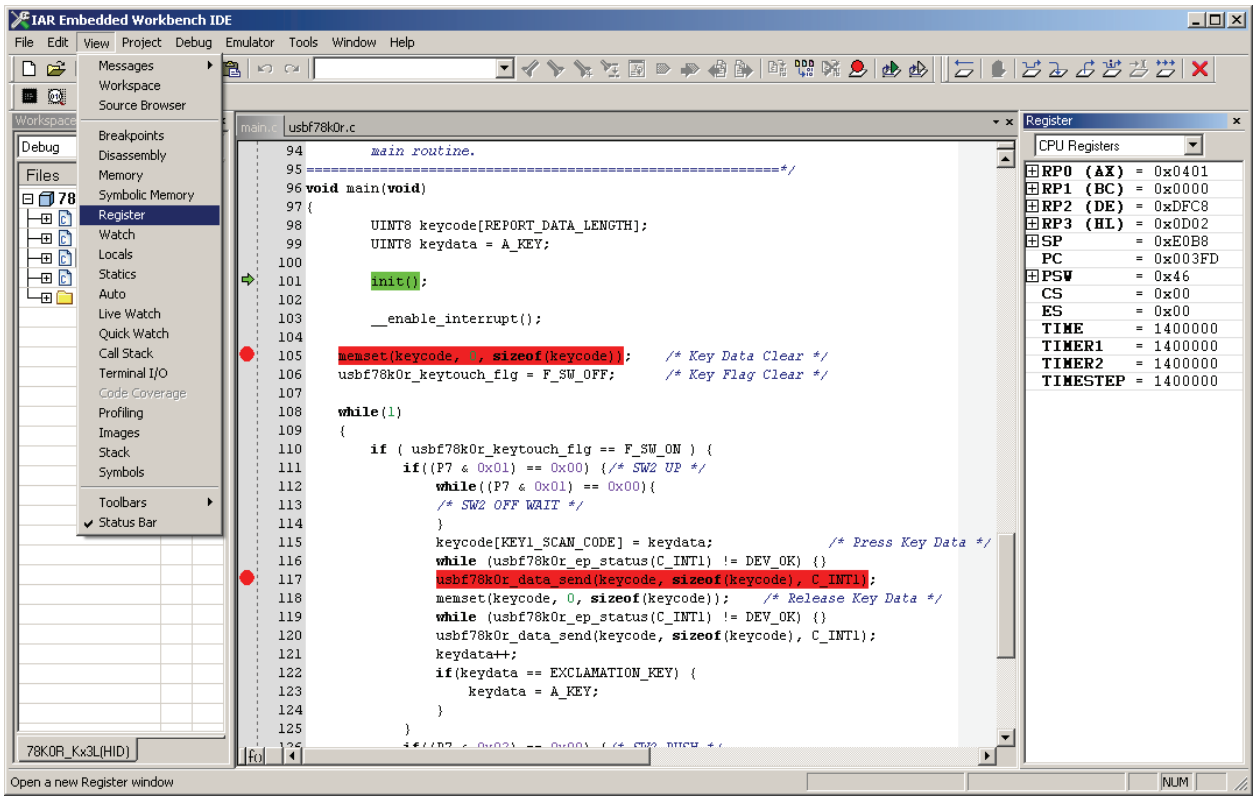


Figure 53 C-Spy Display of CPU- and I/O-Register Content

Please use the list box at the top of the Register Window to select the registers to be displayed.

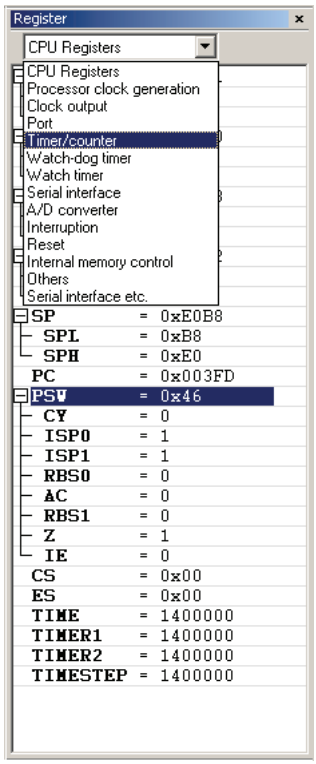


Figure 54 C-Spy Register Window

6.5 Erase microcontroller built-in flash memory

If the On-Chip Debug Option Byte is set to "Do not erase data of flash memory in case of failures in enabling on-chip debugging" and if you forget the security ID, you need to erase the flash memory completely. To erase the flash memory, please follow the steps below.

WriteEZ5 is installed at "2.2.3 Installation of WriteEZ5 Flash Programmer".

1) Start WriteEZ5 by selecting "Windows Start" menu, "Programs", "Renesas Electronics Tools", "WriteEZ5", "V1.00", and "WriteEZ5".

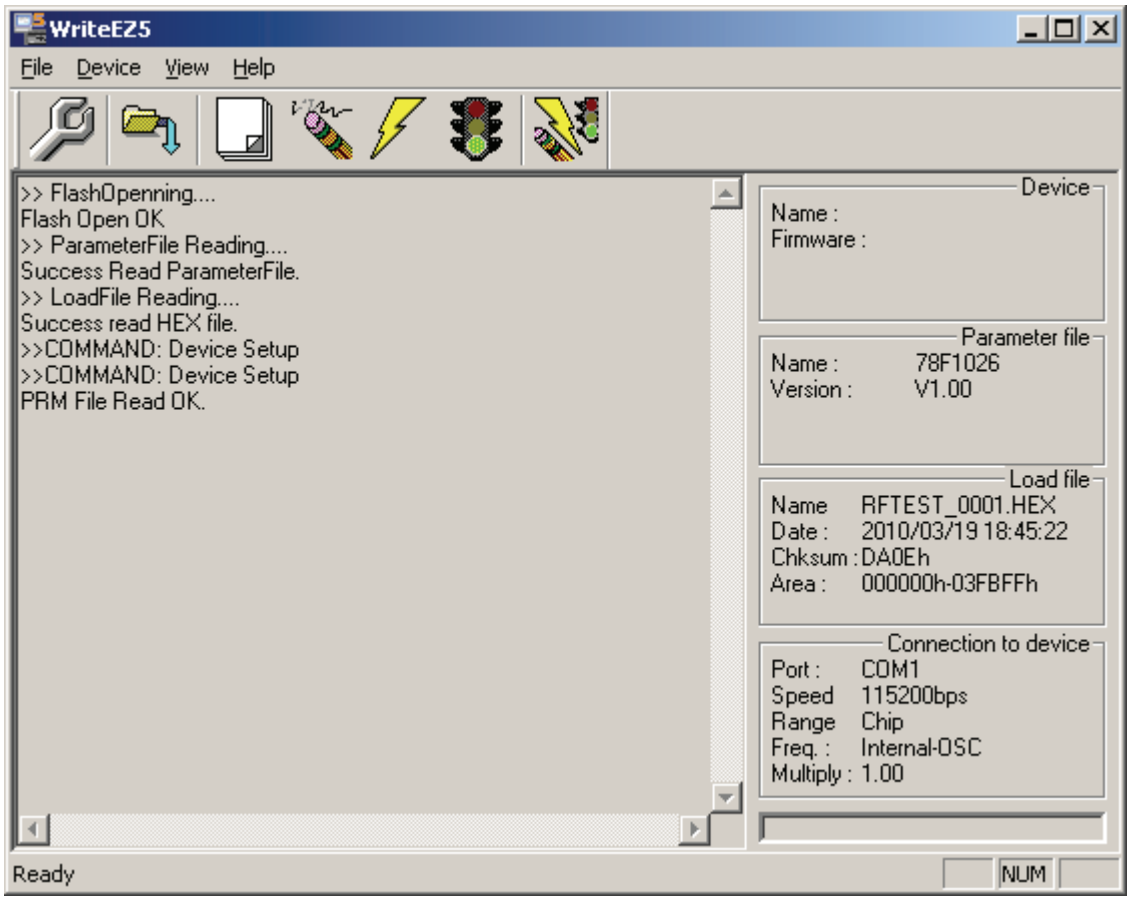


Figure 55 WriteEZ5

2) Set the switch and the jumper pin on the TK-78K0R/KE3L+USB as follows.

SW1							
1	2	3	4	5	6	7	8
ON	ON	ON	ON	ON	OFF	OFF	OFF

Table 11 WriteEZ5 Configuration

Jumper	Position
JP1	short
JP2	1-2 short
JP3	1-2 short
JP4	Short
SW4	Debug Writer

Table 12 WriteEZ5 Jumper Setting

3) Then, please connect the PC to “USB2” on the TK-78K0R/KE3L+USB with the USB cable.

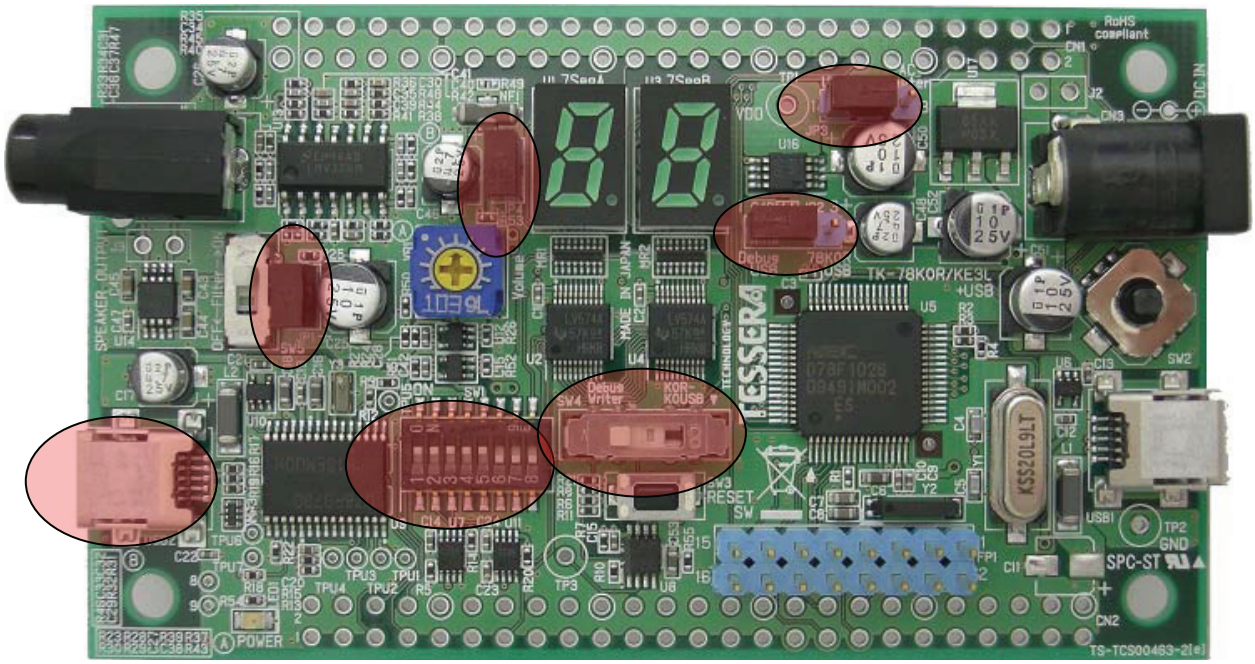


Figure 56 TK-78K0RKE3L+USB Jumper & Switches

4) Push the "Setup" button.

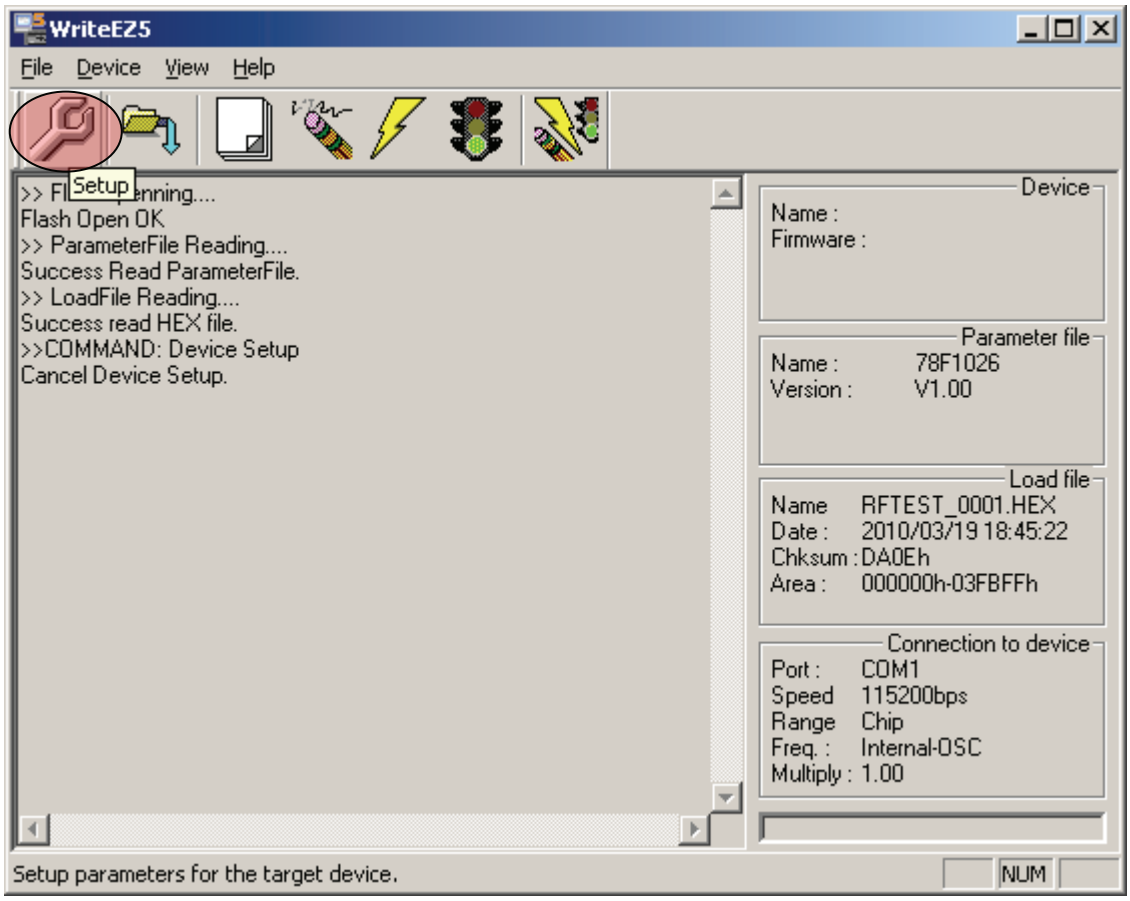


Figure 57 WriteEZ5 Setup Button

5) Push the "PRM File Read" button.

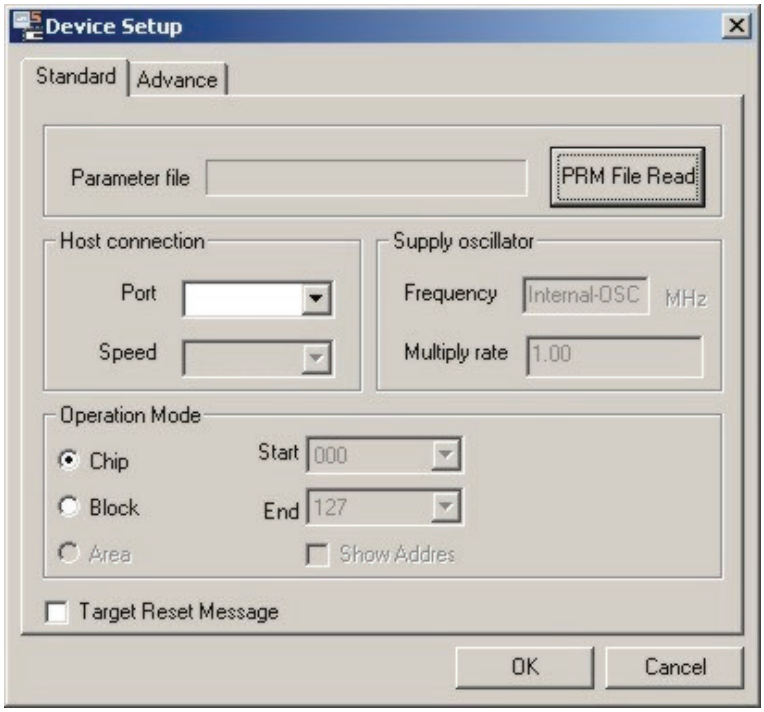


Figure 58 WriteEZ5 Device Setup Dialogue

6) Please select the file “78F1026.prm” in the CD-ROM directory “WriteEZ5\PRM78F1026_V100” .

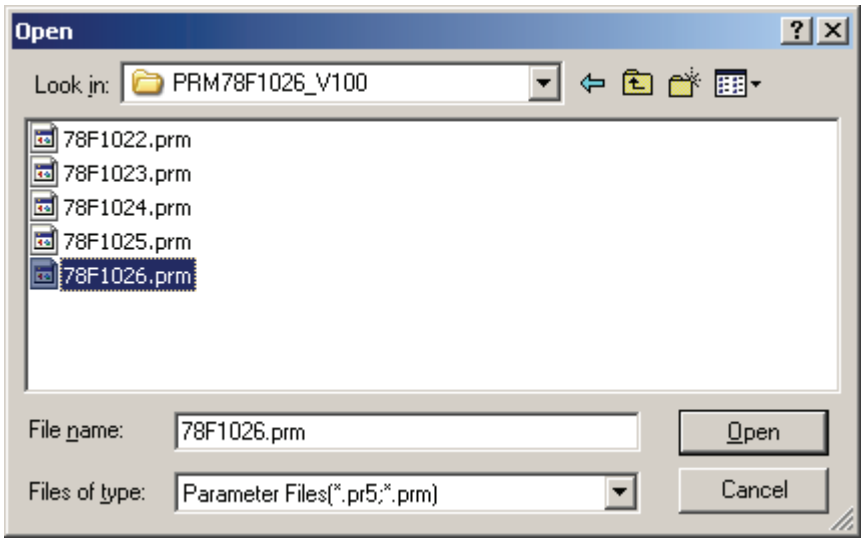


Figure 59 WriteEZ5 Parameter File Selection Dialogue

7) "Port" selects the COM port number where TK-78K0R/KE3L+USB is allocated.
Only the COM port number that the personal computer has is displayed in this pull-down menu.

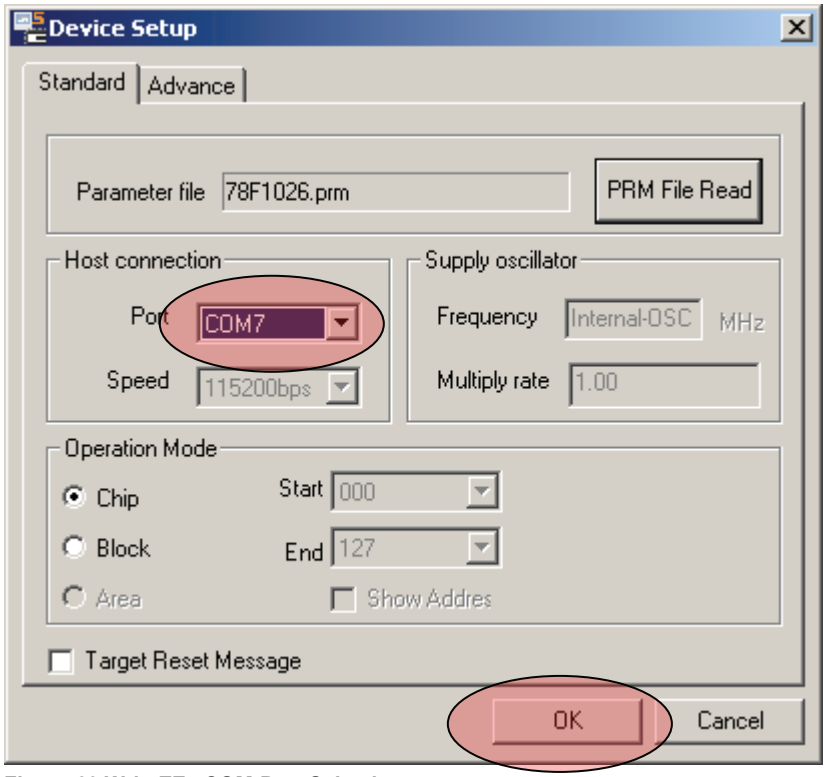


Figure 60 WriteEZ5 COM-Port Selection

8) "Erase": The deletion of the flash memory begins when the button is pushed.

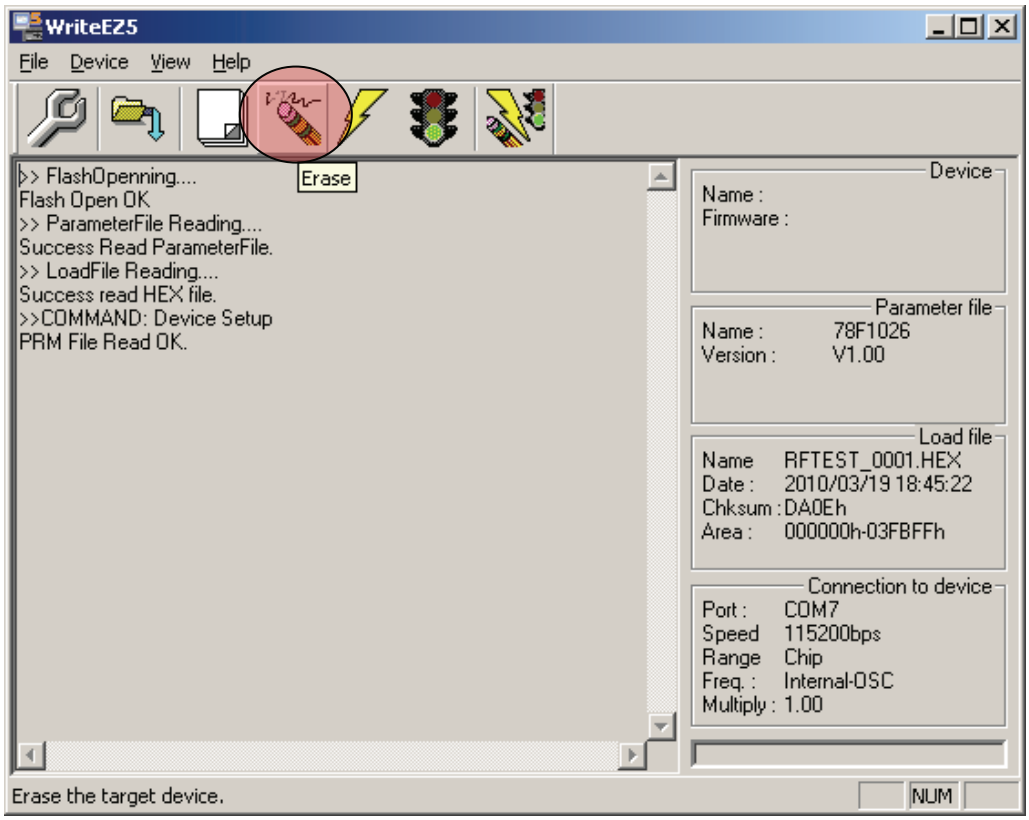


Figure 61 WriteEZ5 Erase Button

9) If Flash EEPROM has been erased successfully, “chip erase finish.” will be displayed.

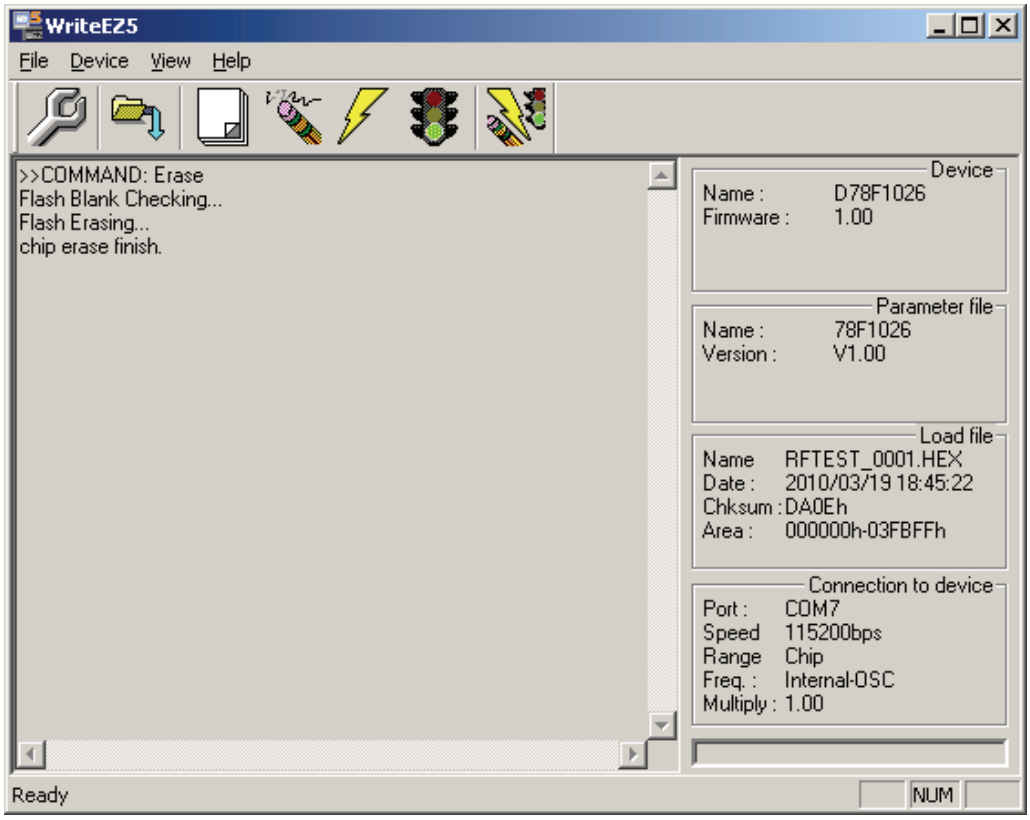


Figure 62 WriteEZ5 Erase completed successfully

6.6 Circuit Diagrams

Please find the schematics attached to this document. To open the attachments view in the Adobe Reader press the paper clip in the lower left corner of the window. To open the attachment, double click the TK-78K0R_KE3L+USB_schematics.pdf.